# THE JOURNAL OF GAS LIGHTING
## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXII. No. 1579.] LONDON, AUGUST 15, 1893. [45TH YEAR. PRICE 6d.



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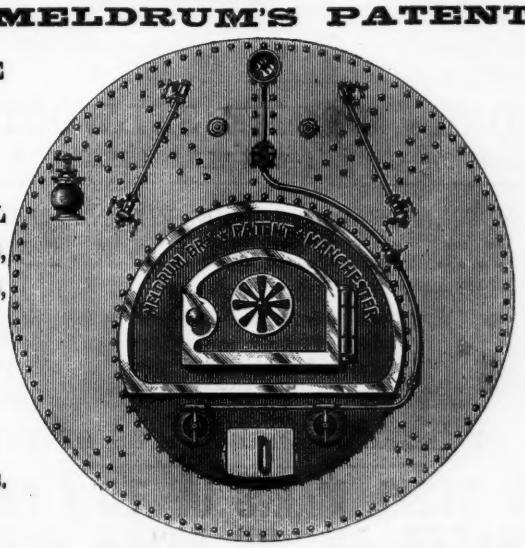


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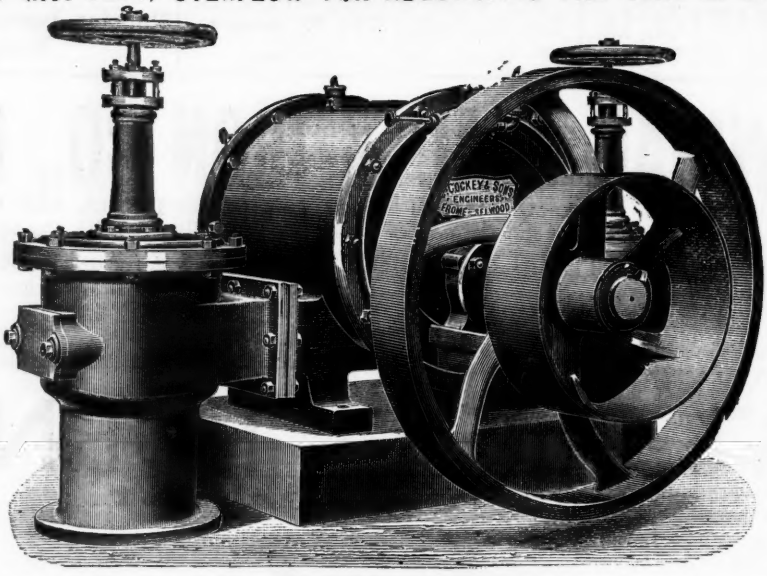


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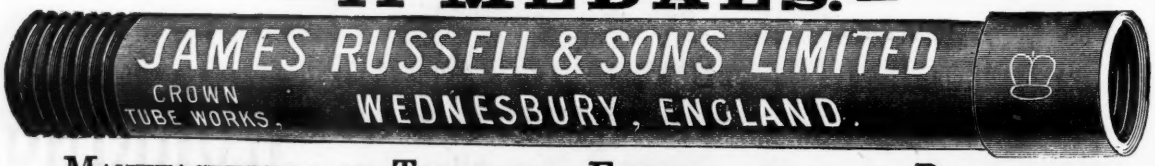


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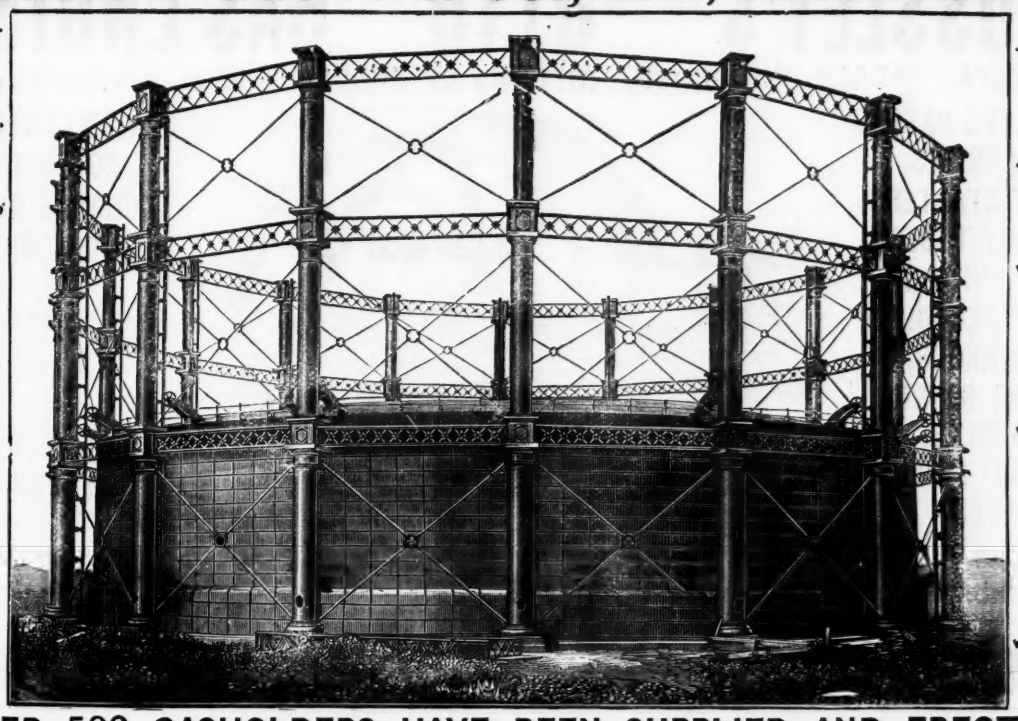

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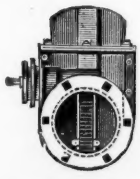

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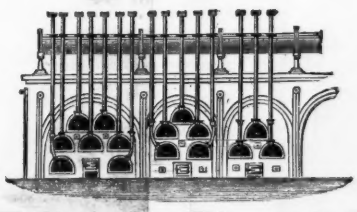

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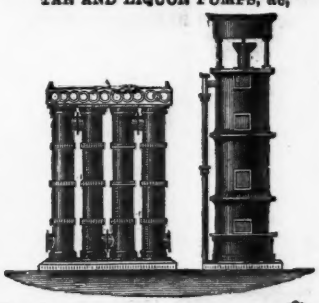

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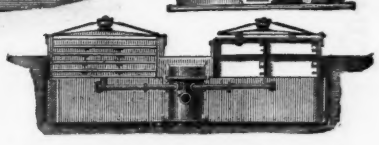

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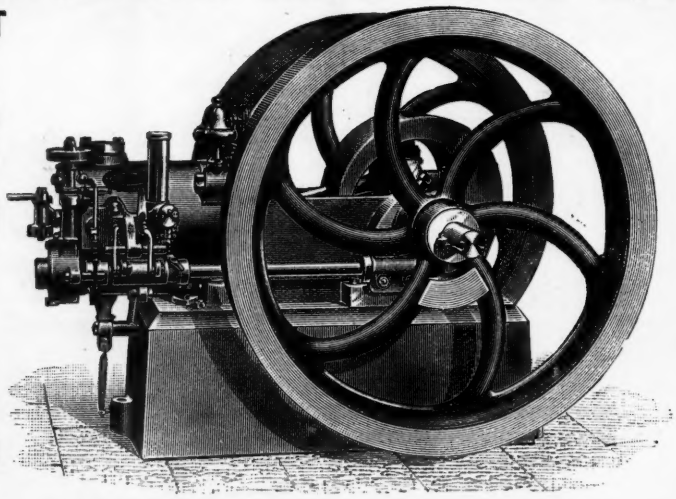

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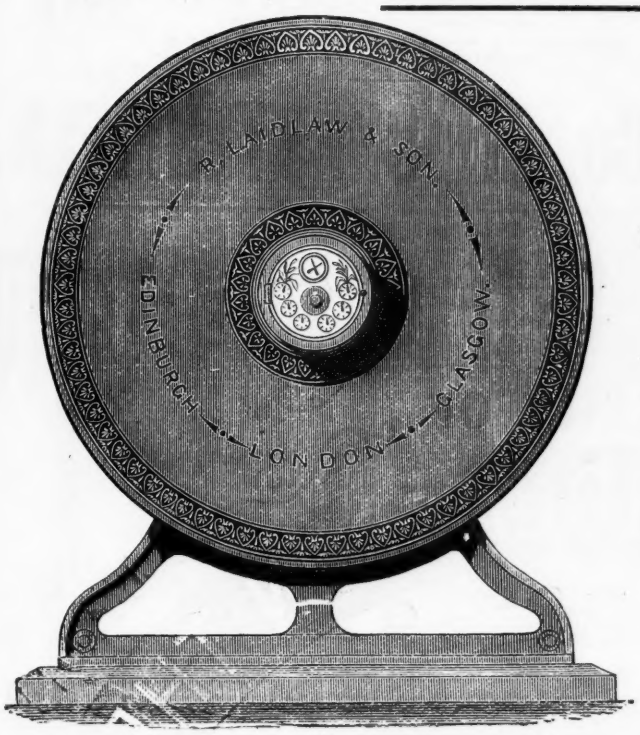


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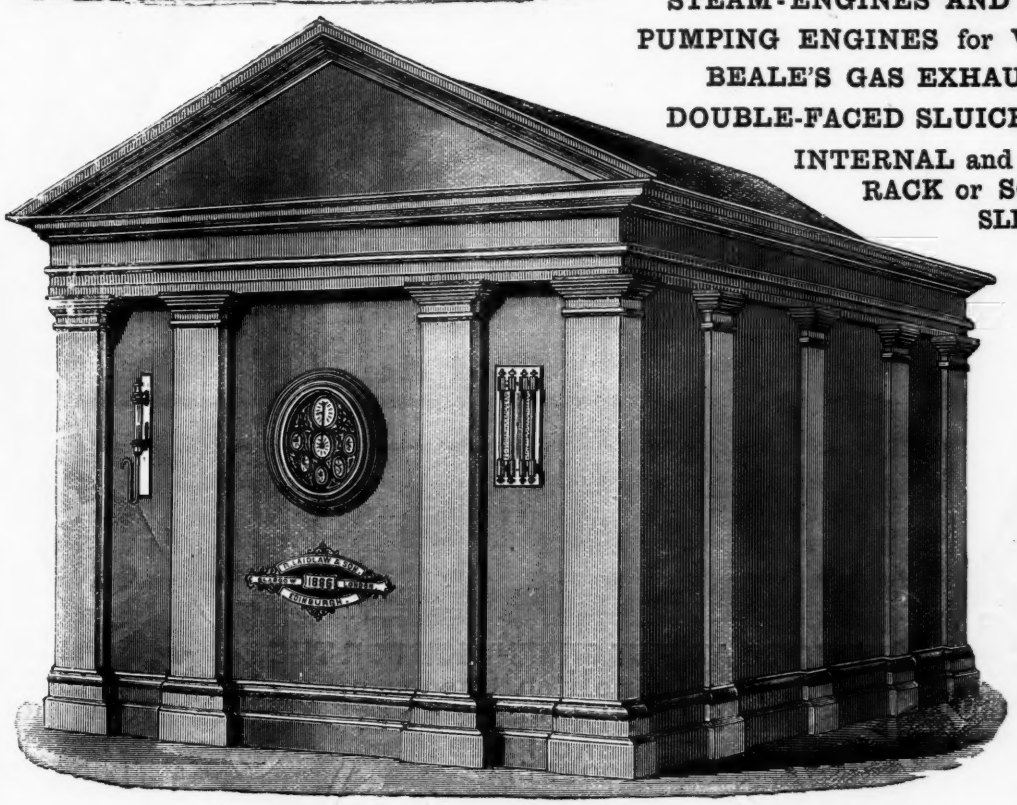

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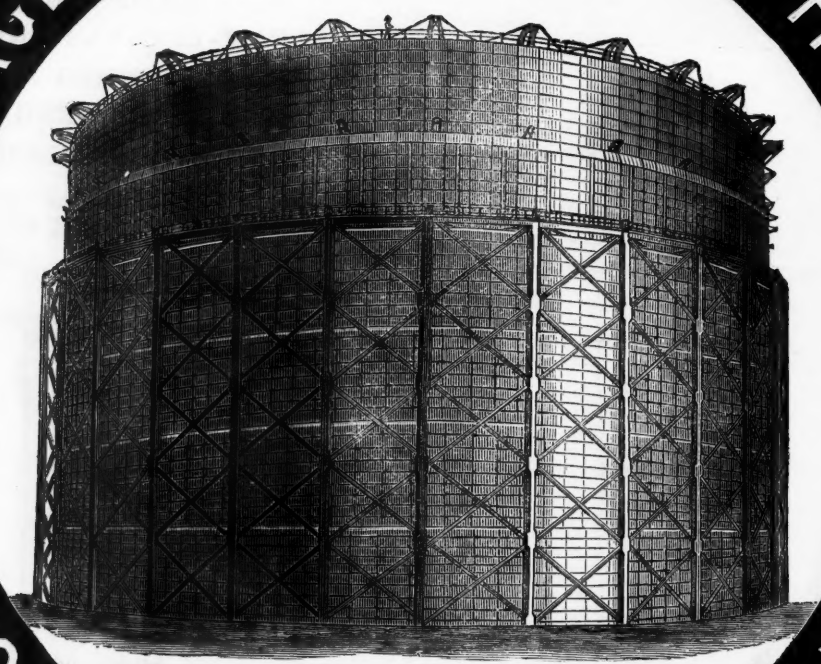

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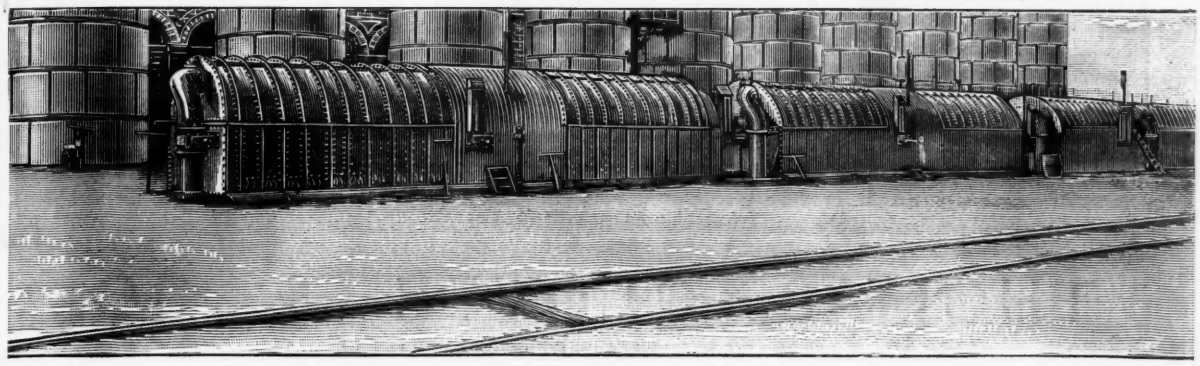

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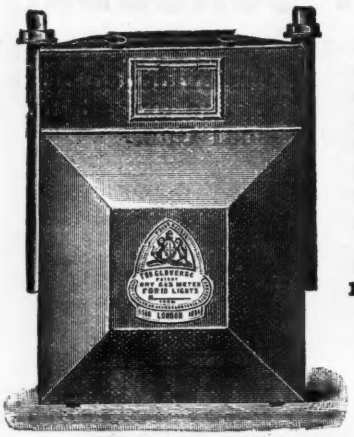

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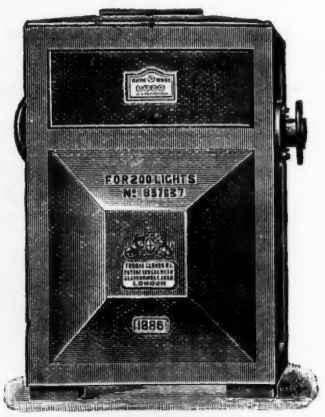


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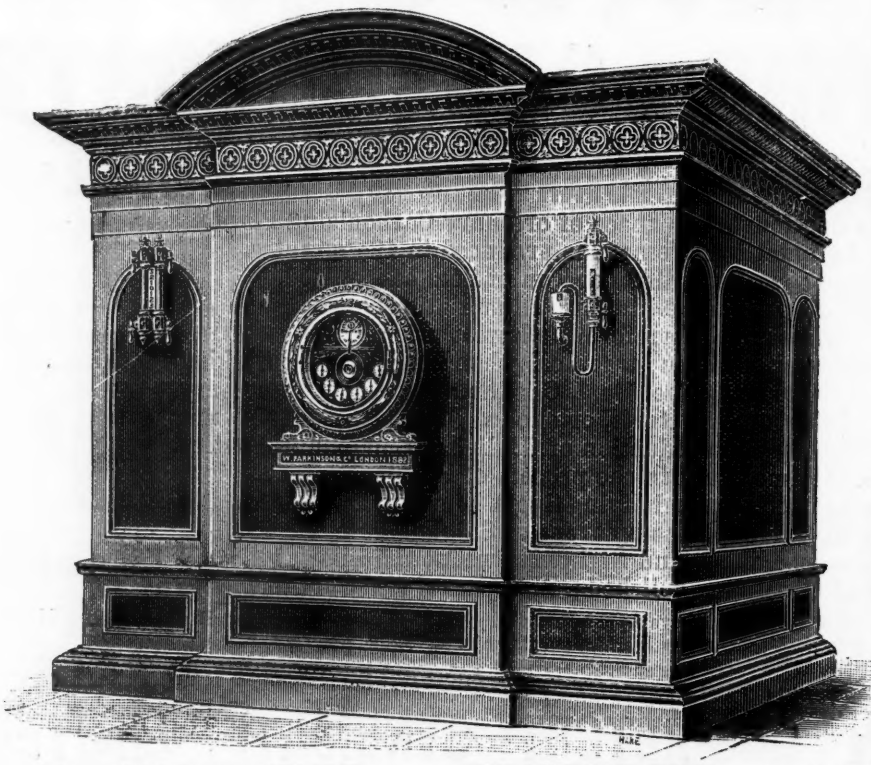

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## TO CORRESPONDENTS.

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THE

# JOURNAL OF GAS LIGHTING,

## WATER SUPPLY, & SANITARY IMPROVEMENT.

*TUESDAY, AUGUST 15, 1893.*


### The Currency Question.

If the public in general do not arrive at an understanding of currency questions, it will not be for want of mention of the subject in the newspapers. We have for some time past had an uneasy feeling that these matters were bound to come to the front sooner or later; and our forebodings have been amply justified. The uneasiness with which we have contemplated the portentous swelling of the topic of bimetallism among contemporary subjects of discussion has been due to the humiliating sense of our incapacity for understanding and pronouncing upon it. The confession may as well be made, for in all probability the majority of our readers are in the same plight. Unhappily, it is impossible to leave the subject alone; for it lies at the very root of the safe conduct of all international industries, of which gas supply is one of the chief. There is only too much reason to fear, moreover, that the commercial world is on the eve of one of those tremendous catastrophes which more or less affect people generally, in whatsoever trade or industry they may be engaged. The reason for this fear is expressible in the single word—silver. Ever since the birth of modern commerce, commodities have been valued either in gold or in silver; and up to comparatively recent times the intrinsic values of these two standards have remained pretty constantly at about 1 of gold to 15 or 16 of silver. So far good. The fact that both silver and gold have been coined into money has nothing to do with their values; because, as a matter of fact, when a country has had to balance its transactions with another by their aid, the object has been more often than not performed by sending bullion. The serious consideration is that some countries have been relying on silver as though it could be depended upon to preserve the same comparative value to gold throughout all time; and this has turned out to be a delusion. Gold has now become the standard of value for all things, and silver has dropped into a mere commodity, like the nickel or copper which are also employed as coins symbolical of a value they do not intrinsically possess. Consequently, nations that have been in the habit of treating silver currency as though it were good for its nominal value, have now to face the hard reality, and admit a shrinkage of from five shillings nominal to three shillings actual, or less. How closely connected the question of currency is with the deepest problems of political economy appears from an eloquent passage of the recent Message of President Cleveland to Congress, which runs thus: "At times like "the present, when the evils of unsound finance threaten "us, the speculator may anticipate a harvest gathered "from the misfortune of others; the capitalist may pro- "tect himself by hoarding, or may even find profit in the "fluctuation of values; but the wage-earner—the first to "be injured by a depreciated currency, and the last to "receive the benefit of its correction—is practically "defenceless. He relies for work upon the ventures of "confident and contented capital. [What a line is this "for our Socialists to ponder over!] This failing him, "his condition is without alleviation, for he can neither "prey on the misfortunes of others nor hoard his labour." Meanwhile, we have some satisfaction in reflecting, amid all the clamour of the time, that we have held fast to the faith in one single standard of value, which is gold. An interesting article in support of the same view is published in the current number of the *Engineering Magazine*. The people of the United Kingdom have much to be thankful for in that, although they may not be able to understand questions of currency, the fact of their dealing in sovereigns protects them from all risk of having to bear the first and sharpest brunt of the conflict into which the people of silver countries must now enter in spite of themselves. Every man who has a piece of gold in his hand possesses that which measures the value of all commodities, independently of legislation, treaty, or agreement.

### The Principle of Betterment.

HAVING referred last week to a certain movement in London municipal politics, which involved the formation of a so-called "League" to provide a policy in opposition to the notorious "London Program," it is only fair to the alleged promoters of this movement to record that it has been announced, through the intermediary of Mr. E. W. Beckett, M.P., that the publication of the new programme was "altogether premature." The document from which our information respecting this scheme was derived is declared to be merely a memorandum of the bases or heads of a programme which may at some future time come to something or nothing. It is to be sincerely hoped, for reasons set forth in these columns in our last issue, that this premature disclosure of the counsels of Mr. Beckett and his friends may have the effect of quashing

the whole thing. It is a ridiculous pretension that the candidature in London County Council elections is not affected by considerations of party politics. Of course, these elections are conducted upon political lines; and any party that attempts to disguise the fact simply throws away an advantage in organization without obtaining any compensating benefit. It is the case all over the country. In these columns we know no parties or politics; but it would be affectation to pretend ignorance of the fact that the composition of every corporation gas committee in the land is determined by political considerations in the first place, although the regular party cries get strangely mingled with administrative developments in the course of time. Speaking of the London County Council, it may be observed that the Bill of this body instituting the principle of "betterment" as a means of providing money for town improvements has been accepted by the House of Commons by an overwhelming majority as against the House of Lords, who wished to throw out the betterment clause. The introduction of this principle into town improvement legislation may have the most important and far-reaching results; and it is perfectly unobjectionable, if carried out under proper safeguards. Towns must be improved, and when it becomes a question as to where the money is to come from for carrying out such work, it is hard to see why the landowners whose property is to be enhanced in value thereby should not be asked to contribute some of their "unearned increment." This is simply putting upon the proper shoulders a burden that, by hook or by crook, the ratepayers as a body have always and everywhere tried to shuffle off. A great part of the improvement of London has been paid for out of the coal and wine dues; and Manchester and Birmingham have been beautified at the expense of the gas consumers. It is time for the landlords to have their turn—especially as coal dues have fallen out of fashion, and gas profits are not so easy to come by as formerly.

### The Ramsgate Gas Undertaking Inquiry.

If only as a curiosity, the proceedings which will be found reported elsewhere concerning the investigation by Mr. T. Newbigging into the condition and management of the Ramsgate Corporation gas and water undertaking, and the action of the Town Council thereon, deserve passing notice here. Local authorities everywhere are pretty much alike. The bulk of the members are, as a rule, sensible men of business and of the world, with whom their officials, if possessed of average tact and ability, can get on comfortably enough. There is, however, in most public bodies of the kind a minority of carpers and quibblers who may be taken to represent, more accurately than pleasantly, the discontented element which exists in all communities; and it is usually upon the professional men in the service of the Corporation that these troublesome individuals fasten. They seldom attack the Town Clerk, for he is a lawyer; and certain classes have a wholesome dread of members of the legal profession. But they are not greatly afraid of surveyors, engineers, or accountants; and it is their favourite amusement to accuse such gentlemen of not earning their money. So it is in Ramsgate, where the position to which Mr. Valon has attained set two or three envious tongues wagging against him and all his works, until the Corporation, in order to quell the annoyance, decided to have the gas and water works reported upon by an independent expert. Mr. Newbigging's commission was extraordinarily comprehensive. He was asked not merely to pass judgment upon the "construction, maintenance, and management" of the gas and water works, but was directed to sit in public at the Town Hall "to receive any statements "that any burgess might desire to make" on the subject-matter of the inquiry; every means being taken to give publicity to these arrangements. The result was a ludicrous exposure of the hollowness of the case against Mr. Valon. No complainants appeared, and Mr. Newbigging had to look up the newspaper reports of the proceedings in the Town Council for the year, in order to ascertain what were the grievances to which he was expected to give attention. His report is a complete answer to the trumpery charges that have been brought against the gas-works management; and the men who made them, and lacked the courage to come forward and "stand to their "guns," are accordingly overwhelmed with derision and contempt. We congratulate Mr. Valon upon the complete justification he has received at the hands of Mr. Newbigging, albeit we never regarded the attack upon him as serious. That he has enemies in and out of Ramsgate is really a compliment to his powers. Most men have to live either in "spite or pity;" and it is unnecessary to specify which life is to be preferred. Mr. Newbigging is also to be complimented upon the skill with which he discharged a duty that in clumsier hands might have aroused some unpleasant comment. His report is no mere "white-"washing," but is a sound exercise in the criticism of gas-works design and management, in which chapter and verse are duly given for every statement made.

### The North of Ireland Association at Coleraine.

The North of Ireland Association of Gas Managers met at Coleraine on Tuesday last, under the presidency of Mr. W. S. Stormonth, Gas Engineer to the Town Commissioners. This is the second time that Mr. Stormonth has filled the chair of the Association; having been called upon last year to take up, as Vice-President, the duty which the then President (Mr. M'Callum, of Omagh) was prevented, by domestic affliction, from discharging. This circumstance should, in fairness to Mr. Stormonth, be borne in mind when his Inaugural Address is considered—not, indeed, that this is in any respect an unworthy production, but it gives additional force to the complaint of the author as to the difficulty he experiences, in common with the rest of the numerous band of Presidents of Gas Managers' Associations, in finding fresh matter to discourse upon. At this rate, it will not be long before we shall be threatened with a strike of Presidents against the arduous work of composing an Inaugural Address; and, as it is, Mr. Stormonth's expostulation is a strong endorsement of the action of the Committee in delegating a couple of members to attend the Federation Conference to be shortly held under the auspices of the South-West of England Gas Association. A pleasant incident of the meeting was the presentation of a gold watch to Mr. James Whimster, of Armagh, in recognition of his great services in connection with the formation of the Association in 1887, and as Honorary Secretary since. Papers were read by Mr. C. B. Outon, of Inchicore, who has been elected President for the ensuing year, and by Mr. A. Main, of Glasgow; and a lecture on oil-gas manufacture was delivered by Mr. W. Ivison Macadam. The next meeting will be held in Armagh.

### The Coal Miners' Strike.

There is very little to be said this week about the coal miners' strike, beyond remarking that trouble has also broken out in South Wales, while the Federation men appear to be waiting in hopes of the coalowners giving way. Matters are not very satisfactory in Scotland; but we hope that an agreement between the Scottish masters and men is not impossible. There is a passage worthy of notice in the report issued last week to the members by the officials of the Northumberland Miners' Union, after a conference between the Wages and Executive Committees on the present state of affairs. This report refers to the difficulty, which has been very apparent throughout the present dispute in the coal trade, in obtaining and preserving a clear view of the condition of miners in different districts in respect to wages. It appears that in Northumberland wages are actually 10 per cent. higher than even the 1883 scale would have given the men; so that to strike for the 16¼ per cent. advance, as demanded by the Federation, would end abortively in the opinion of the Northumberland Union Executive. The report further points out that many of the men are much misled from time to time by newspaper statements relative to rises in the price of coals. These statements are promulgated without a word of explanation of the small difference these advances (which only apply to a fraction of the total output) make in the price of the whole of the coal sold over the three months. It is hoped there are enough members of the Northumberland Miners' Union with so much experience of wages regulation by coal prices as to prevent the general body from being misled by these "trans-"parent fallacies" of the newspaper press. But this risk is nevertheless a real one, and is one of the drawbacks of a free and independent press—which occasionally carries its independence to the extreme of dispensing with facts. The truth of the matter is that too many newspapers only pay attention to the state of the coal trade, or any other industrial subject, when a great strike or lock-out brings

affairs in connection with it into such prominence as to warrant their inclusion as a head-line in the contents bill. These journals take their news wherever they find it, and deal with a trade dispute upon the same principle as they do a sensational divorce case or a "scene" in Parliament. Hence come confusion and blundering; and those people who are content to follow newspaper views of things in general necessarily get but a very one-sided, sketchy kind of information. This does not greatly matter in regard to some subjects; but much mischief ensues when people who do not know better take for gospel all that newspaper writers say concerning industrial problems which require to be solved, if at all, with regard to data seldom known to, or properly appreciated by, the class of writers in question. The complaint is an old one; but the grievance is continually arising, and there is small hope of curing it.

**Mr. J. H. Wilson in Trouble Again.**

The lot of the Trade Union agitator is not always a happy one, as Mr. J. H. Wilson, M.P., is now finding out. His recent failure at Guildford must have been more than a little unpleasant; and now, at Liverpool, he has been cast in substantial damages for libelling the well-known firm of shipowners trading as Allan Bros. and Company. The points of this latter case are few and simple, and are worth telling as an illustration of the ways of the New Unionists. The Glasgow managers of the famous Allan Line found it necessary, at the beginning of the present year, to follow the example of other houses, and reduce the wages of their seamen. This brought the Seamen and Firemen's Union about their ears; and there was a brief strike, which had the effect of clearing out the Union men from the service. Meanwhile, the firm had no difficulty in procuring fresh hands; and, in order to prevent similar annoyance at a future time, they required their servants to enter into a twelvemonth's agreement, subject to certain penalties. This did not suit Mr. Wilson's book at all; and accordingly the Union, finding the firm decided in carrying out their new policy, declared bitter war against them. All sorts of libellous imputations upon the Allan ships and the owners were published and circulated, with the object of injuring the firm; it being stated, among other things, that intending passengers by the line would have their lives endangered by going to sea in ships manned by incompetent seamen. The firm could not be expected to put up with this treatment; and so they brought an action against the Union, the Secretary, and Mr. Wilson himself. The action failed as against the Union, for the reason that no such body can be sued, as it is devoid of corporate existence. This is one of the beauties of the law as it stands. As *The Times* puts it: "Among the somewhat "anomalous advantages which labour possesses in its "conflicts with capital, is the privilege of banding its "members together into organizations which are able to "command immense powers of attack and resistance, "while enjoying practical immunity from civil process." However, if the law could not reach the Union, it could, and did, reach Wilson, who would not venture into Court to defend himself in person against the assault of his slow-moving, but terribly precise, antagonists. So he is ordered to pay £200 more, for the luxury of law; and the Union has a whole bagful of nails driven into its coffin.

**Too Much Gas.**

A curious report comes from a source calling itself the Taxpayers' Association of New Utrecht, Long Island, relative to a grievance suffered by the much-enduring and sorely-oppressed "citizens" of this remarkable town, which is none other than the "over-abundance" of "street "illumination." A lawsuit has actually been brought by one resident against the Board of Improvements of the town to restrain this body from spending so much money in gas. It is demanded that one-half of the street lamps in New Utrecht shall be forthwith shut off, which would involve the suppression of 2000 unnecessary lamps. The preparation of the case has involved the indignant ratepayers in a good deal of trouble, as might be supposed. The town has been divided into districts, and citizens have been engaged in patrolling at night, with the object of locating superfluous gas lights. It is to be hoped that the public-houses were closed at the time, or some of the self-appointed lighting inspectors may have seen, before their wanderings ceased, more unnecessary lamps than could have been located next morning. The talk of 2000 redundant lamps, however, suggests an after-dinner arithmetical exercise. Thirteen photographs of the alleged extravagant street lighting have been made, for use as exhibits in the case. The faithful camera, of course, cannot lie; but, as an English Judge is reported to have remarked recently, "if photographs cannot lie, photo-"graphers can, and occasionally do." The New Utrecht Taxpayers' Association is "anxious to receive help in its "effort to have less gas burnt, and is looking for new mem-"bers to swell its ranks." The cause the Association has espoused is an odd one—indeed, unprecedented; and we shall be curious to learn how the matter fares in Court.

## WATER AND SANITARY AFFAIRS.

The attempt of the House of Commons to overthrow the Lords' amendments on the General Powers Bill of the London County Council has resulted in what the *Daily Chronicle* is pleased to call a "miserable compromise." But undoubtedly the Council have gained something, seeing that they are to have three representatives on the Thames Conservancy Board, where hitherto they have had none. They would like to have more, and thought themselves modest when they asked for seven, afterwards coming down to four. On the Lea Conservancy they have been less lucky; being left where they were, with simply one representative, in place of the three for which they went to Parliament. In the expenditure of money on inquiries and negotiations, the Council are to be absolutely limited to £1000 per annum; the Local Government Board having no power whatever to augment the amount. A further enlargement of the Thames Conservancy takes place, by the addition of a representative from each of the four riparian counties of the Lower Navigation. Next year a more comprehensive treatment of the question is to be effected, by the introduction of a Bill to amend the Public and Private Acts governing the constitution and powers of the Thames Conservancy Board. This Bill is to be brought in by the Thames Conservators themselves; or, if they take no action, the County Council are to undertake the task in 1895. The arrangement now agreed upon is accordingly of only a temporary nature; and three years hence there may be a different order of things. In the matter of representation, Mr. H. H. Fowler asks that the County Council shall "be content with three members for the present." But there are other parties having a very direct interest in this subject, who are most strangely overlooked. Viscount Hampden, in the House of Lords, very properly called attention to the position of the London Water Companies, who, as he remarked, paid many thousands a year to the Thames Conservancy Board, and were specially interested in preserving the purity of the river. His Lordship urged that the Companies had "a very strong "claim to representation;" and he could not look upon any settlement of the question as satisfactory or permanent which did not fully recognize their rights in this respect. We may be sure that, if the County Council are left to bring in a Bill, there will be no place allotted to the Companies. Yet there are the strongest reasons why they should have a proper share in the representation. They are largely taxed in aid of the Conservancy revenue; and if the principle that taxation and representation should go together has any application in this case, the Companies ought not to be shut out. Their representatives would serve the interests of the public, by advocating those measures which would most effectually promote the good condition of the stream. It is certain that this view of the case will have to be considered when the promised Bill makes its appearance.

The annual report of the Thames Conservators has been issued within the last few days, showing a receipt of more than £18,000 from the London Water Companies. Two-thirds of the revenue of the Upper Navigation are obtained from this source. The Conservators are diligent in protecting the river above London from being polluted, whether by town sewage or by houseboats and launches. A great improvement in the state of the Thames near the Metropolitan outfalls has no bearing on the subject of the water supply, but is in itself a very encouraging result. To the Metropolitan Board is due the credit of having initiated the process by which that part of the river is rescued from its former noisome condition, though the

County Council have stepped in at the right moment to carry off the laurels. Respecting the actual drinking supply of the Metropolis, the report by Dr. Frankland for the past month is satisfactory in a marked degree, as on former occasions. The supply given by the New River Company is described as ranking, in regard to chemical purity, "with the best of the deep-well waters." The East London Company removed 99·26 per cent. of the microbes, by means of storeage and filtration. One of the Southwark filters removed 99·72 per cent.; and in the supply from one of the Southwark wells the microbes were only six per cubic centimetre. The volume of the Metropolitan supply, though not so large as in June, was very considerable; being not far short of 207 million gallons per day, or nearly the same average as in May. That the Companies are able to keep up this enormous supply, making no appeal for retrenchment, shows how thoroughly they have realized their responsibility to the inhabitants of London and its environs, and also gives evidence of the skill and energy with which the abnormal demand has been met. The predicted crisis does not yet appear.

The negotiations between the Portsmouth Corporation and the Portsmouth Water Company, to which allusion was made in a recent issue of the JOURNAL, have led to the preparation of an elaborate report, in which the Special Committee entrusted with the matter review the whole situation; glancing at the past, touching on the present, and breathing hopes of great gain in the time to come. According to the estimate, the Corporation, as buyers, would have to issue stock to the amount of £1,030,250, to which would have to be added the costs of promoting the necessary Bill in Parliament, the amount of the stamp duties on the transfer, and the expenses connected with the issue of the stock. So that probably the actual amount of stock to be created would be not less than £1,036,000. If the Corporation can prevail upon the powers that be to extend the repayment of the money over eighty years, the annual amount required for interest and redemption of principal would be £34,306 14s. 2d. This, as the Committee suggest, would be reduced to £32,785 1s. 8d. if the repayment were spread over a hundred years. But it appears to us by no means likely that the longer period will be sanctioned; and the Corporation will probably do well to base their calculations on a more moderate estimate of the indulgent tendencies of the authorities. Taking the eighty years as a probable concession, the present income of the undertaking would not be sufficient by about £2026 to meet the charge for interest and redemption of capital. No doubt, however, some saving might be made in the expenses of administration—whether or not with advantage to the consumers, time alone can show. In this connection, it is interesting to note the method of compensation suggested for the Directors and officers of the Company—a subject which may not improbably give rise to considerable discussion. The proposed purchase-money includes a sum of £14,000 for distribution among the six Directors (whose aggregate remuneration at the present time amounts to £840 a year), and some of the officers of the Company. The principle on which this sum is arrived at is not disclosed in the report; nor is there any precise information as to the compensation to be paid to the Secretary, the Resident Engineer, and the other officers. Some of these gentlemen may probably be continued in the service of the Corporation; and the present idea seems to be that the officers who are not re-engaged by the Corporation shall be compensated partly out of the beforementioned sum of £14,000, and partly out of the Company's reserve fund. Encouraged by precedent, the Committee hold out the prospect of their being able to obtain a postponement of the first contribution towards redemption of stock for a period of five years. No doubt this is an attractive bait, because the postponement would allow time for an increase of income, and might probably enable the Corporation to meet the whole annual charge without drawing upon any source save the water-rates. This, of course, from the ratepayers' point of view, is a "consummation devoutly to be wished." But, after all, the report should be taken merely as a general recommendation of the basis on which the Committee think they should be allowed to go to work. If it be adopted, and the Corporation show that they mean business, the Directors will, it is stated, permit experts, nominated for the purpose, to inspect the works and examine the books.

The *Law Times*, in a recent issue, condemned in very trenchant terms the shortcomings of the average auditor. We are not concerned to formulate the auditors' defence; but it is pertinent to point out that, in regard to the Metropolitan Water Companies, the Legislature has prescribed a system of official audit which has worked well in the interests alike of shareholders and the public. Each Company is required to fill up and forward annually to various public authorities a statement for the last financial year. The accounts are to be in such form and to contain such particulars as may from time to time be prescribed by the Local Government Board. Anyone is entitled, on paying a shilling, to have a copy of the accounts; and for failure to comply with these statutory requirements a Company would incur a cumulative penalty not exceeding £10 a day. As to the Official Auditor, he is to be "a competent and impartial person," from time to time appointed by, and removable by, the Local Government Board. The Metropolis Water Act, 1871, minutely prescribes the Auditor's duties. If he finds the accounts correct, he is to certify them; but if in any instance he considers the accounts of any Company incorrect in principle or in detail, he is to require the Company to correct them in such manner as he thinks right. Careful provision is made by the Act for ensuring the requisite facilities, without which an audit would be incomplete; and, lest the Auditor should act oppressively or unreasonably, it is enacted that any act or determination on the part of that official in respect of which any Company may think themselves aggrieved is to be referred to arbitration. Such, briefly stated, are the statutory provisions in relation to the Metropolitan Water Companies. It is conceivable that, if a somewhat similar enactment were in force with respect to building societies, certain recent financial scandles might have been averted.

**The London County Council and Petroleum Lamp Accidents.**—In view of the numerous accidents resulting from the defective construction or careless management of petroleum lamps, the London County Council have had printed and circulated some valuable suggestions to users of these lamps. It need scarcely be stated that they are partly founded on the recommendations made by Sir Frederick Abel, F.R.S., and Mr. Boverton Redwood.

**The Inertness of Quicklime.**—A communication on this subject was recently made to the Chemical Society by Mr. V. H. Veley; and an abstract thereof appeared in the *Chemical News*. The experiments recorded in the course of the paper were conducted on a much larger scale than hitherto; and the amount of combination between the lime and carbon dioxide as dependent on the conditions of (1) moisture and (2) temperature was investigated. It was shown that the combination is incomplete, not only with lime to which 11 per cent. of water is added, but even with the hydrate. The presence of 10 per cent. of free water in the hydrate increases the absorptive power nearly fourfold. Dry carbon dioxide combines with lime to a slight extent at 300° C.; to a greater degree at 350° C.; and fairly completely at 420° C. Lime and sulphur dioxide, when dry, begin to combine at about 300° C., and more completely at 352° C. But at a higher temperature the resulting sulphite is decomposed into sulphate and sulphide, and by the interaction of the latter and the sulphur dioxide, sulphur is formed. There is a great similarity in the behaviour of dry carbon and sulphur dioxide as regards the amounts of them absorbed by lime under the same conditions of temperature. It is noted that quicklime does not absorb nitrous fumes at ordinary temperatures.

**Artificial Light.**—Some interesting comparisons are made by Herr C. Feldmann, in a recent number of the *Journal für Gasbeleuchtung*, between the light derived from different artificial sources and daylight. He concludes that artificial light is most satisfactory when, under spectroscopic examination, it approaches as closely as possible daylight in the nature of the rays. The electric arc lamp and the Auer incandescent gas-light are the artificial sources of light that approach sunlight most nearly ine character; but all artificial light has a warmer or more golden tint than daylight. Ordinary gas-flames and low-power incandescent electric lamps emit the red and yellow rays in great excess, and are consequently still less satisfactory. The percentage of the total radiation that is received by the eye as light, varies immensely in different sources. It is lowest in the candle and the ordinary gas-flame produced with a slit burner, and increases in the Argand and regenerative burners, until in the Auer burner it amounts to 20 times the percentage of effective radiation in the candle. With incandescent electric lights it is slightly higher; while, in the arc light, even 80 times the proportion of radiation effective for lighting to the total radiation of a candle may be attained. The radiation available for heating purposes, of course, varies inversely with the light radiation. The author concludes that suitable coloured reflectors attached to the arc lamp will give a light closely approaching daylight in character.

# ESSAYS, COMMENTARIES, AND REVIEWS.

## GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 329.)

After the Bank Holiday of Monday—a not unwelcome interval after the highly-strung and feverish time which had marked the previous period in the Stock Exchange—business was only gradually resumed on the reopening of the markets on Tuesday, and quietude was the order of the day. As the week proceeded, the tone improved (especially in that hotbed of commotion, the American department), and prices mended materially. At the same time considerable caution was, and is still being, exercised. The key of the position lies in the solution of the great Silver Question; and it remains to be seen whether the disastrous Sherman Act will be repealed. Thus the past week has, on the whole, been quiet and rather dull; and business has been on a restricted scale. A rise in the Bank-rate was regarded as almost inevitable, to check the run upon its resources; and this probability had a restraining influence. True to the general expectation, the Directors raised the rate to 4 per cent.; the 3 per cent. rate having lasted only a week. So high a rate as 4 per cent. is rare at this time of the year; but the circumstances causing it are extraordinary. The Gas Market has fairly maintained its degree of activity, considering the season; and its firmness is still more pronounced. A few small advances are to be noted; and there is no instance of a retrogression *per contra*. Gaslight "A" was only moderately dealt in; but prices were singularly even and steady—business being marked nearly every day at 231½, and the quotation is 1 higher. A more than proportionately large amount of business was done in the secured issues, especially the debenture stocks, at good figures; and "K" has advanced a point. Very little was done in South Metropolitans; the debenture stock being the most active, and improving one point. The issue of the report and accounts for the past half year has not affected the stocks in the market. Commercials were quiet and featureless. Very little business was transacted in the Suburban and Provincial Companies; but a favourable incident was the recovery of Alliance and Dublin. The Continental undertakings shared in the general quietude, but marked prices testified to their continued firmness. None of the other Companies presented any feature of note. There was a good deal more activity in Water; and several issues have scored further advances in value.

The daily operations were: Business in the Gas Market was very quiet at the opening on Tuesday, and remained sluggish all that day, but prices were firm. In Water, East London advanced 2. On Wednesday things were even quieter—almost stagnant; and market movements afforded no indication of a tendency either way. East London Water rose 1 more. Thursday showed more briskness, with a good demand ruling for debenture and good preference stocks. Gaslight "A" advanced 1; and South Metropolitan debenture made a similar move upward. The characteristics of Friday were similar; but business was a little quieter. Gaslight "K" improved 1; and both the Alliance and Dublin issues gained ½ each. Saturday was fairly busy; and prices remained unchanged.

## ELECTRIC LIGHTING MEMORANDA.

**The St. Pancras Vestry Electric Lighting Experiment—The Stafford Corporation Electric Lighting Scheme—Municipal and Company Ventures in Electric Lighting.**

It will be remembered by regular readers of these "Memoranda," that there was a little breeze in the St. Pancras Vestry in regard to the proposal to extend the electric lighting undertaking by the erection of a second generating station; one of the vestrymen—Mr. G. M. Clements—opposing the proposal on the ground that the undertaking has been a heavy loss to the ratepayers. Mr. Clements set out his views in a formal paper, which was referred to the Vestry Clerk and the Consulting Electrical Engineer for their observations. These have now been put upon record; and the whole matter has been published as an excerpt from the Vestry minutes. Mr. Clements's charges (summarized by himself) are that "the Stanhope Street installation, which was to have cost £50,000, has cost nearly £100,000. The cost of production of the light is nearly half as much again as it was prophesied it would be. Instead of making the large profits that were promised by Mr. Gibb and Professor Robinson, the Vestry has lost more than £6500 by the speculation last year, and will probably lose this year nearly £5000 more. And all this loss is in spite of the fact that the private consumers have to pay 6d. per unit for the light, instead of 4½d. or 4½d. which it was said was to be the price charged to them." Mr. Gibb's reply to this indictment is a very clear statement, showing that the total cost of working the undertaking for a year, including interest and redemption is £12,398, which will be about covered by the revenue derived from private consumers. In this expenditure, the cost of street lighting, amounting to about £4000, has been included; so that, as Mr. Gibb argues, the ratepayers either get this public lighting free, or, if the Vestry prefer to pay for it, there will be this sum to the good, by way of profit. Besides, he says, naïvely, the ratepayers "will be saving £1340 per annum which they would otherwise have had to pay for the inferior lighting by gas in the same area." Is Mr. Gibb an Irishman, that he should thus make the splendid "bull" of representing the outlay of £4000 for what formerly cost £1340 as a clear "saving" of the latter amount? It is true that he leaves out of his account of working expenses all such matters as depreciation, wear and tear, rents, rates and taxes, administration, and legal charges, &c. But as there is no way of getting at the correct amounts to be debited against the revenue account under these heads, they may be left to be disclosed in due course of time. The Vestry have decided against Mr. Clements, which is, of course, a victory for Mr. Gibb and Professor Robinson. The rights of the matter are nevertheless not placed beyond the region of controversy.

The Corporation of Stafford, upon electric lighting intent, betook themselves for advice to Dr. John Hopkinson, F.R.S.; and this eminent authority has naturally reported in favour of the idea, and, also naturally, in favour of the adoption of his own three-wire direct-current system, supplied by steam-engines and a small battery of accumulators. To do Dr. Hopkinson justice, however, it must be conceded that his report is a singularly fair statement of *pros* and *cons;* and that supposing the thing to be worth doing, his plan is probably as good as any that could be suggested in the circumstances, and better than most. He tells the Corporation that they are favourably situated for supplying electricity, having a gas-works of their own in a capital position for a central station, and the conditions being promising for economical generation and distribution. On the other hand, he does not forget to point out that the demand for electric light is not likely either to be large in Stafford, or of a highly profitable description. This consideration brings the Corporation face to face with the question whether it is worth their while to take so much trouble for so little return either in thanks or profit. Dr. Hopkinson had been asked to look into the question of generating electricity by gas power. He peremptorily dismisses the suggestion, for two reasons—firstly, because gas-engines are less steady in operation than steam-engines, which means that with the former more accumulators would be required; and, secondly, because, "on everything but a small scale, steam is cheaper than gas." Dr. Hopkinson recommends the Corporation to start with a 2500-lamp plant, at an estimated capital cost of about £12,000. He puts the running expenses of such a plant at £1780 per annum; but he is commendably cautious about estimating revenue. Still, he thinks that an electric lighting station "will certainly pay in Stafford; but that the "profits will not be large, as the business will be small." This is plain speaking; and the Corporation are to be congratulated upon having elected to take the advice of a specialist who has not said good-bye to common sense, like some others who would have gladly pocketed their fee and given them a prophetic rhapsody in return. The Corporation are going to apply to the Local Government Board to grant them a loan of £20,000 for electric lighting purposes; and the Gas Engineer (Mr. J. Ferguson Bell) is to prepare the necessary plans of the building, Dr. Hopkinson is to be the Electrical Engineer during the construction of the works.

Our contemporary the *Electrical Review* has published some remarks upon the supply of electricity by municipal authorities, *à propos* of a paper recently read by Mr. Robert Hammond before the Association of Municipal Engineers (an abstract of which appears elsewhere), which was nothing more than an appeal for custom in the House-to-House interest. We are told that the present position of the electric lighting industry in due to private enterprise, inasmuch as of the total capital sum of 4½ millions sterling actually sunk in central stations in the United Kingdom, only £474,000 has been contributed by local authorities. And quite enough too, we should say, seeing that every central lighting station in existence is yet in the experimental stage. When we come to consider works in construction, however, the case is altered, for while the new companies are represented by £79,000 of capital, the local authorities are booked to spend no less than £766,000. "The spirit of progress now possessed by the local authorities is still more marked in the stations decided upon, the construction of which has not yet commenced. The companies have £25,000 against £807,000 for the local authorities." It is all very well to call this a manifestation of the "spirit of progress." We read the figures differently, assuming them to be reliable. The money in course of spending or to be spent upon central electric lighting stations by local authorities means the cost at which, in many instances reluctantly, they are preserving Provisional Orders from lapsing. The small venturing due to private initiative means that capitalists do not find the electric lighting business good enough to go on with, at least until the big companies have shown what they are able to do for their shareholders. Consequently, there is nothing for Mr. Robert Hammond and his kind to do but court the municipalities, although what place the genus "promoter" can find in the working of local authorities is not very obvious. We should have supposed that advisers of municipalities would look very much askance at gentlemen like Mr. Hammond when these set themselves to recommend how public money should be spent. It is a favourite plea of this class of advocates that the supply of electricity by local authorities stands on the same grounds as the supply of gas and water. Even the *Electrical Review* cannot support

this argument, because it recognizes that electric lighting is and can be nothing but a luxury, which cannot be said of gas, still less of water. "We are not over-sanguine that the price of electricity will be materially reduced from present rates, unless by means which will practically render obsolete all present modes of generation." This must be very comforting to those local authorities who have pledged their rates to supply this fashionable toy.

## THE TRIUMPH OF FREE LABOUR IN AUSTRALIA.

MATERIALS are accumulating for that popular compendium of industrial economy upon a basis of facts which we hope to see brought before both wage-earners and employers by capable expositors, to take the place of the socialistic nonsense vented by the present order of labour leaders, which does such infinite harm to those who credit and act upon it. We particularly desire to draw attention to a series of "Letters from Australia" that have recently appeared in *The Times*, and especially to the issue for the 18th ult., giving the history of the four great Australian strikes, which are described as four campaigns in the same war. This war was waged over the same principle that has lately divided employers and employed all over the world—the question whether the workmen's Unions or the masters should have the control of the industries in which the men are engaged. Nowhere have the strength and the opportunities of militant Unionism been greater than they were in Australia when the leaders essayed the fatal enterprise of attempting to obtain control of the methods of production. The workers appeared to be masters of the situation; and they declared that no non-unionist should live in the land. If there is a country in the world where labour is favourably circumstanced, and where it has a chance of successfully propounding its own terms, it is Australia. "A new country, of boundless extent, where labour is comparatively scanty and in great demand; a country where the capitalists are isolated from one another, and where the Government is as democratic as anywhere in the world, is, one would have supposed, the ideal country of the labour party." Yet when this party put forth all its strength to secure the supremacy of the Unions, it was so disastrously beaten that at the present day the men "have not a kick left in them;" and the strike period is declared to be over and done with, as far as the Australian working man is concerned.

The interest and value of the letter to which reference has been made lie in its account of how this war broke out, and how it was quelled. Australia has always had the character of being the working man's paradise, where all the legislative advantages clamoured for in old countries are enacted, and living is cheap; while a reliable climate renders "playing" less penible than it is apt to be in cold northern regions. So long as they confined their operations within what he compendiously calls "the bonds of justice and common sense," it is the opinion of the correspondent of *The Times* that the Australian labour party did succeed, by united action, in improving upon the favourable conditions of a new and rich country, and in forcing concessions from recalcitrant employers. Up to a certain point, that is to say, the Trades Unions did well, and enjoyed the sympathy and indulgence of the general public. But the leaders could not, or would not, leave well alone. It is the same story everywhere; only in Australia the tale is particularly clear and easy to follow. Up to a definite date, "conflicts between employers and employed had turned mainly upon questions of terms, wages, and hours of employment, in which the men had devoted themselves, usually with very considerable success, to improving their material condition." The men were organized, the masters were not; and the principal industries were worked mainly under Union rules.

The time came when the men thought fit to assert and glorify the power of Unionism as an institution for its own sake; and with the same the masters revolted against a power which became more oppressive and dictatorial every day. The quarrel that thus arose was not one of material conditions. There was no question of advancing or reducing wages, or of altering the hours of labour. It was a fight to determine the legitimate boundary between the rights of the employers and the employed. In the opinion of the men, the employers' theory of "freedom of contract" struck at the very root of Unionism; while, in the opinion of the employers, the men's claim for "recognition of Unionism" would, if conceded, have destroyed the foundations of industrial enterprise. As the writer says, fairly enough: "It was in an industrial form the same fight which has been fought again and again in other departments of the world's history—of the liberty of the individual against the power of an institution." He gives to both sides credit for putting themselves to trouble, danger, and expense for the sake of a principle which they held dearer than any personal convenience. Neither side has shrunk from renewing the conflict as often as was necessary, in order to put to the most searching test the conclusions achieved; and the result, which has left victory with the masters, is "so important, not only for Australia, but for all the world, that its significance can hardly be overrated."

The war began at the Newcastle coal mines in 1888, with the first determined stand of owners against the constantly increasing power of the Miners' Union. After a strike of eleven weeks, the men gave in; their resources being so broken upon that only a few months ago they meekly accepted a reduction in wages, the necessity of which was brought about by the injury done by themselves to the trade of the district. This Newcastle strike was the first trial of strength on the question of whether or not the owners or the Union should frame the rules under which the men were to be employed. It was, however, still partly confused by a question of terms; and it was not till the maritime strike of 1890 that the term "freedom of contract" came into prominence. Before this strike was over, there was a clear recognition on both sides that this was the supreme issue over which the fight was being waged. By this term the employers meant "the right of any worker to accept work from any employer, and the right of any employer to engage any man wanting work—that is, the right of any person to give and accept employment without interference." The opposition term "recognition of Unionism" is not so clearly defined; but it is pretty generally understood to mean the exclusive employment of unionists, which involves working under Union rules. The employers urged that the cause they were fighting for was not that of masters against men, but of Industry against Unionism. What the domination of Unionism might mean to employers transpired in the arrogant manifesto issued in 1890 by the Amalgamated Shearers' Union, which ran thus: "We intend to teach the squatter the folly of resistance to our organization. He shall not be allowed to shear his wool except by Union labour. But if he should succeed in getting the wool off the sheep's back, it may rot in his sheds, for we shall prevent the carriers taking it to the railway. And should he succeed in getting it to the railway, we shall prevent it being stored on board ship, for we shall call out the wharf labourers; and if stowed, we shall prevent it going to sea, for we shall call out the sailors and the officers; and if it sails, we shall prevent its discharge in London, for we shall call out the dock labourers." Only substitute the word coal for wool, and we have a companion picture to the miners' and gas stokers' position at home about the same period. This statement also goes to show that the Australian subscription to the London dockers' strike funds was less an act of pure benevolence than a retaining fee.

Now, the Australian wool industry, if it was worth attacking in this style, is also worth defending; and what the strikers succeeded in teaching was not the folly of resistance to their organization, but the necessity of organized defence. The employers took a leaf out of the unionists' book, and federated themselves so effectively that when at length the outbreak came, the men were confronted by a solid array of capital, energy, and intelligence. The maritime strike broke out simultaneously with that of the shearers; and the shipping industry co-operated with the wool-owners in putting an end to a state of things that had become unendurable. Like the Wilsons at Hull, the Australian shippers had recognized Unionism for some years, only to learn that it meant an intolerable—and, what was more, a thoroughly unbusinesslike—tyranny. If the domination of the Union had really been for the good of trade, if it had tended to keep up rates, or had any other useful effect, the shipping interest would have borne with it; but it was utterly unintelligent, and merely meant the incessant interference and dictation of men who did not bear the slightest share of financial responsibility in connection with the trade. This, in the opinion of the owners, meant nothing less than the ultimate destruction of the carrying industry; and so when the war really began there was a general determination to carry it on until the principle of freedom of contract was assured. The agitators talked, like John Burns, of a universal strike; but while this threat only banded the employers more closely together, it disclosed two serious weak points in the position of the men. One was that a universal strike, by calling out the members of all the Unions in the country, would cut off at a stroke the entire supply of wages, from which the sinews of war were to come; the other was the discovery of the large quantity of non-unionist labour existing in the country. There were volunteers for every industry. The question became mainly one of protecting free labourers while at work; and this was done by sufficient force of military and police. The result was not long doubtful. Within a month it was evident that the strike was a failure. "Public sympathy was alienated from the men by the inconveniences inflicted on the community, the short supplies, the dearness of coal, and especially the two days of darkness which resulted from the extinction of the gas at Melbourne."

The unionists were beaten all along the line. Those employers who had recognized Unionism for the sake of peace and quietness, discovered their mistake; and some who sacrificed their independence in the hope of escaping from the inconvenience of a strike, were no better off than the rest. Moreover, the same complaints as those with which we are familiar here arose of the worthlessness of the men's leaders. Employers declared that the great obstacle in the way of the amicable settlement of difficulties with the Unions was "what is sometimes mildly described as a lack on the part of the representatives of the men of that business training which teaches men to recognize the binding nature of contracts. In other words, it has been frequently found that engagements which have been entered into are repudiated when it is no longer convenient to adhere to them; and this has brought about a reluctance on the

part of the employers to waste their time in what they term idle conferences." In the end, it came to be a matter of choice between two forms of agreement for service. The document propounded by the Union forbade the employment of non-society men, and stipulated for the appointment of Union delegates to overlook the work. This was their embodiment of the "recognition of Unionism." The employers refused to sanction an arrangement which took the management of their business out of their hands, and left them only the responsibility of paying wages. They accordingly published a counter form of agreement, containing the same terms as to wages, &c., but providing for freedom of contract. The unionists resisted, and tried by force of arms to prevent the free labourers from working. The Government acted with promptitude, however; and what threatened to be a civil war on a small scale was crushed, and with it the hopes of the strikers.

The last struggle of militant Unionism in Australia was the celebrated Broken Hill strike, where during the palmy times of the mine the men received 10s. per day for practically four hours' work, from which luncheon and walking time had to be deducted. Here the *casus belli* was the refusal of the owners to submit to the dictates of the Union; and before the issue was determined in their favour, the men lost £200,000 in wages, besides using up all their savings, and consuming a sustentation fund of £28,000. The owners of paying mines lost dividends during the eighteen weeks that the strike lasted. But the ore remained in the earth to be taken out; and the permanent gain in management more than compensated for the temporary loss. Moreover, the amount of work done is greater than before the strike; and individual miners make 60 per cent. more money.

From all these facts, which are not disputed on either side, certain conclusions are to be drawn. In the first place, it has been shown that industrial combination is a game that two sides can play at, and that the united capital and intelligence of the employers are more than a match for the coarse strategy of the labour leaders. It is also clear that Unionism in its later development has separated from the great bulk of the labouring population, and that in Australia, as in South London, "the fight which the employers conducted has been almost as much a fight of Free Labour *versus* Unionism as of masters *versus* men." This conclusion, as *The Times* correspondent remarks, has an important bearing on the future of both parties. "It constitutes the best check upon any tendency on the part of the employers to misuse their victory by narrowing it to class purposes; and thus alienating the support of a large portion of the labouring body." On the other hand, it should open the eyes of the Union leaders to the fact that "there must be something seriously wrong with a system which, while it professes to control the labour of the country, leaves outside its ranks a number of labourers sufficient to supply all the requirements of the employers, and to nullify the effect of its most active operations." One of our English demagogues has admitted that "the blackleg controls the situation;" but it seems beyond the powers of the Union managers to account for the overwhelming preponderance of free labour in every land. All they can do is to call the free worker bad names. But this does not advance their cause or tend to reduce the hosts of the enemy. Summing up its correspondent's testimony, *The Times* says, in a leader, that "Australia has done the world a great service in thus carrying out, on a large scale, experiments in the working of the labour problem. The 'New Unionism' is proverbially not very far-sighted; but we can hardly suppose that the lesson of these Australian contests will be altogether lost upon those who represent it here, and who to a great extent direct the actions of the men. They cannot fail to see, for example, that what they found to be the case at Hull will always be the case; that the closer and more aggressive the union of the men, the closer and stronger will be the union of the employers; and that the exclusiveness of Unionism is certain to create a plentiful supply of outside labourers, ready and even eager to take the opportunity of supplanting the men towards whom their feeling is one rather of jealousy and resentment than of sympathy." With these weighty comments on a striking tale, we leave the subject for the present.

**Mr. W. T. Batten, Assoc. M.Inst.C.E.,** formerly Manager of the Singapore Gas Company, Limited, has been elected to fill the vacancy on the Board caused by the death of Mr. R. Stannard Foreman.

**The Management of the Civil Engineering Business of Mr. F. Siemens.**—Mr. Frederick Siemens, of Queen Anne's Gate, Westminster, has appointed Mr. Emil Biedermann and Mr. Ernest William Harvey to succeed the late Mr. John Head as Managers of his civil engineering business for this country, France, Belgium, Spain, Portugal, and America. These gentlemen have for many years been engaged as engineers on Mr. Siemens's technical staff.

**Large Masonry Dam for the Boston (Mass.) Water-Works.**—A large masonry dam is to be constructed for the Boston (Mass.) Water-Works, across the valley of Stony Brook, in the town of Southborough. Its total length will be 2000 feet; and its greatest height 75 feet. The water surface of the basin, when full, will be between 1500 and 1800 acres; and the basin will hold 7500 million gallons. Mr. W. Jackson, City Engineer of Boston, prepared the plans for the work, which has to be completed by Nov. 1, 1896.

## COMMUNICATED ARTICLES.

### COAL GAS: ITS MANUFACTURE, DISTRIBUTION, AND CONSUMPTION.

**A Series of Articles for Gas Students.**

(*Continued from p.* 125.)

PUBLIC LIGHTING.

The lighting of the public streets by coal gas is a matter that calls for the careful consideration of the gas manager, although, on the whole, it has not received anything like the attention its importance warrants.

Coal gas, as a public street illuminant, cannot, if judiciously employed, be surpassed, nor even equalled, by any other known means of illumination, whether as regards control, efficiency, adaptability, or economy. The requirements of public lighting are very varied. Hence no hard-and-fast rule can be laid down, either in respect to the extent of the illumination or the method to be employed. Experience, however, indicates the following conditions as essentials to the satisfactory fulfilment of the requirements of the public in this connection:—

(1) The maintenance of a practically unvarying intensity of the illuminant.
(2) Even distribution of the illumination over the whole area to be lighted, rather than the excessive illumination of a certain number of spaces therein comprised, with intervening periods of gloom, and more or less deficient lighting.
(3) The regular maintenance of the given standard of luminosity during the period of the lighting contract.
(4) Economy.

(*Mem.*—These remarks apply to *useful lighting* only, rather than to *ornamental illumination*, which must, of course, be considered from quite a different standpoint.)

(1) *The Maintenance of a Practically Unvarying Intensity of the Illuminant.*—In the lighting of our public streets, constancy and reliability in the means adopted are, in the interests of the public, of the first importance, both as regards convenience and safety. A system that fully satisfies this requirement is therefore the one that will be unhesitatingly approved and adopted in preference to others which, however pretentious and brilliant, may not be constant. Hence it is that coal gas, with all the facilities we now have for employing it to the best advantage, is so well adapted for, and has been so successfully applied to, the purposes now under review.

(2) *Even Distribution of the Illumination over the Whole Area to be Lighted.*—This condition applies chiefly to the lighting of large open spaces, and is also of great importance in ordinary street lighting. It would therefore indicate the desirability of employing, in large spaces, a number of lamps of moderately high candle power in preference to one, two, or three, as the case may be, very large lamps of great luminosity. In this connection, coal gas can readily beat the electric arc lamp out of the field altogether. A generous use of (say) 30-candle power gas-lamps in the lighting of squares, large areas, markets, and railway stations will give an effective illumination, with which, in point of view of real utility and comfort, the arc light will not compare for one moment.

The same applies in a less degree to ordinary street lighting. The general effectiveness of the means employed will be more or less enhanced by the class of buildings on the opposite side of the street; some styles of architecture lending themselves to the refraction of light, and even diffusion to an appreciable extent, in a much greater measure than others. In any case, if the condition named is not to be altogether ignored, the lamps will not be more than 40 yards apart; and, if of the ordinary 15-inch square pattern, they will be provided with flat-flame burners and governors passing 5 cubic feet of gas per hour, and giving an effective illuminating power of not less than 12 or 13 candles. In fairly busy thoroughfares, it is not unusual to employ twin burners consuming 10 or even 15 feet of gas per hour. The best form of the ordinary square lantern is a puttyless lamp of very light, though strong, construction, efficiently ventilated, and having the inlet air supply well diffused (not concentrated in some contracted openings immediately underneath the flame), and made as wind-proof as practicable. The object of making the frame as light as possible is to prevent the casting downwards of deep shadows, just where light is most wanted. The tip of the burner should be just under two-thirds the entire height of the lantern. This raising of the flame gives, as it were, not only a greater cone of light, but the flame burns in a hotter atmosphere than if it were lower in the lantern, and furnishes a correspondingly brighter light.

(3) *The Regular Maintenance of the Given Standard of Luminosity during the Period of the Lighting Contract.*—This condition opens up a number of considerations, none of which have always received due attention. First, the illuminating power of the gas itself must, of course, be maintained up to the standard. Secondly, although the quality of the gas may be kept up, the light emitted at the burner tip may still be very deficient. This deficiency may be due either to obstruction in the service-pipe or lamp-fittings—reducing the pressure of the gas at the burner—or to condensation of the gas, which

is sure to mean the loss of valuable hydrocarbons. Both of these difficulties may, in a great measure, be provided against by having *a full gas-way from the main right up to the lamp governor*. Square or even round elbows, sharp turns, and tubes of less than ¾ inch diameter, are not permissible in lamp connections below the tap; and an ample fall to the main should be insisted upon. Another important item is to avoid unnecessary exposure of the rising service-pipe. For this reason, wall-bracket lamps (highly favoured by some local authorities on account of their inexpensive connections) are a source of endless irritation, owing to the deposition of naphthalene just above the ground-level, or liquid condensation of other hydrocarbons. In winter time these pipes are often found to be completely choked through their whole length with such liquids, frozen solid to the full bore of the pipe. This however, is not of general occurrence where the pipes are of smooth bore, and laid with a good fall to the main. The usual method of clearing a service-pipe choked with naphthalene is by removing the lantern and lamp-fittings, and pouring methylated spirit down the pipe. If this fail, the pipe must be thawed with hot water, or by heat externally applied. If there should be any permanent lodgment of water, the service must be relaid, but with a greater fall than it had previously.

Although not directly affecting the luminosity of the lamp, it may here be observed that the stand-pipes should be wedged, or otherwise firmly secured in position, inside the column, to prevent the vibration to which they are otherwise liable, with the consequent loosening of the screwed joints, and leakage of gas. Another source of irregularity in the gas-flame may be the want of an efficient governor. The necessity for these useful appliances in public lighting is now too well recognized to need emphasizing here. They are apt, however, when in use, to "stick" occasionally; thereby either unduly checking the flow of gas, or permitting it to pass uncontrolled. The governors should therefore be periodically inspected, and renewed where necessary. This latter remark applies also to the burner tips, which, if not perfect, will cause irregularities in the gas-flame, to the considerable detriment of its luminosity. An ill-shaped flame may sometimes be caused by a slight obstruction—dust or otherwise—lodged in the burner slit. This will be readily removed by drawing (say) a thin smooth card or paper through the slit. (A penknife blade, or anything metallic, is apt to damage the burner.) If the lamplighter carefully brush the burner tip every time he cleans the lantern, as he should do, obstruction in the slit will be of rare occurrence. Thirdly, given a gas of standard quality, and lamp-fittings all perfect, the light emitted from the lamp may yet be far from satisfactory, owing to the condition of the lantern itself. The effective lighting power of a lamp will be most prejudicially affected if any of the lamp-glasses be broken or absent. Draughts of air playing on the flame seriously reduce its luminosity, and by causing smoke (arising from imperfect combustion of the gas) will also render the glasses dirty, and thus indirectly still further reduce the effective duty of the lamp. Thus it is of great importance that the lanterns should be maintained in perfect repair. Lastly, keep the whole of the glasses well cleaned, *at least* twice a week in a manufacturing district, and once a week in a district free from smoke and dust, and oftener if circumstances permit. A district bristling with bright, clean lamps in perfect condition, and each one with a well-formed gas-flame of satisfactory illuminating power, is one of the best advertisements for a gas undertaking; and, by the pleasing effect necessarily rendered, not only reflects credit on the management, but indirectly keeps the local authorities and the public in good humour—a consummation that "pays well." It should also be borne in mind that the small extra expense entailed is more than compensated for by the extra light thus obtained, while the other side of the question pictures a negligent management and endless irritation, bickerings, and friction with the public representatives.

(4) *Economy*.—This question as applied to public lighting is best considered by attention to little matters. First in importance stands the employment of that lantern which is best adapted for developing the highest luminosity from the gas consumed, under the particular circumstances attending the position in which the lamp is placed. For instance, a wall reflector lamp, however perfect in design and construction, will not be used in the centre of a large square; neither will a Sugg 100-candle power lamp be suspended from a bracket fixed on some street corner, except for advertising purposes. Nor will a lamp of open construction be placed in a position peculiarly liable to heavy wind gusts, or a well-constructed wind-proof lantern be erected in the best-sheltered corner of the district. The matter of economy is also well considered by careful attention to the various provisions already suggested, which are designed rather as a preventive of, than a cure for, any after-troubles with the lights; and, costing but little at the outset, may mean afterwards a very material difference in the working expenses, with, of course, a correspondingly reduced charge for the lighting. Then, again, the employment of a first-class governor, by which the stipulated quantity of gas, and that only, will be delivered to the burner, is an untold means of saving to the undertaking, and thus indirectly to the consumer also.

It has been strongly urged in some quarters that the most equitable method of supplying and charging for gas to public lamps is by the "average meter system," according to which, at certain points in the area lighted, one of the lamps is supplied by meter, and the consumption of gas thereby recorded is taken as the average for that of the whole of the lamps immediately surrounding. For many reasons, based on experience, the writer refuses to acknowledge the necessity for this system, and he would prefer to depend entirely upon the use of an efficient governor to each separate lamp. Due care should, of course, be taken that the governors are maintained in good order, and that the lighting and extinguishing of the lamps is promptly executed according to the regulations. The consideration of the construction of gas burners and governors is deferred till a later chapter dealing with the chemistry of gas consumption.

There are in use a great variety of types and patterns of public lamps, an epitome of which is quite unnecessary here. Those principally in use are, however, of the type already described, or modifications of that pattern, and the high-power polygonal or globular lanterns with flat-flame burners. As already intimated, the well-known square 15-inch lantern, if constructed somewhat as suggested, and mounted on the column by means of scroll irons and set pins (in lieu of the old-fashioned and hideous "cage"), is very serviceable for the cheaper class of street lighting. The best patterns are a happy blending of lightness in construction with great durability and strength, and are almost universally made of copper throughout. The bottom of the lantern is so divided into halves (one portion being a hinged flap to allow of the admission of the lighting-torch) that there is practically no shadow cast down; and, as a whole, they are a vast improvement on the older patterns, which, with their heavy frames and paint-bedaubed glasses, are so suggestive of "deep bordered note." Due provision is made for efficient ventilation and the carrying off of the heated products of combustion; whilst the fresh-air inlet is with advantage fixed at the top. By this arrangement, the top of the lantern is kept comparatively cool, and is therefore much less liable to fracture; the air supply becomes heated before reaching the flame; and the luminosity of the latter is thereby directly increased. The same effect is also still further gained, but indirectly, by the absence of those strong draughts of cold air on the flame which necessarily attend the introduction of the air supply directly underneath the flame. The bottom of the lantern should be mounted not more than from 9 ft. to 9 ft. 3 in. from the ground. The burner will be so placed as to throw out the flame at *right angles* to the line of the street. "Catoptric" lamps are of the ordinary shape; but they have a number of reflectors placed in the tops and upper portions of the sides—thus concentrating the light downwards. They are not suitable for ordinary lighting.

As regards improved street lighting with high-power lamps, this is inseparable from the names of Mr. Sugg and Mr. Bray, who have in this connection done such noble service to the gas industry and to the public. Their lamps are too well known to need description. They are now almost universally fitted with clusters of flat-flame burners; these being found more satisfactory for outdoor lighting than the Argand type. Some of the lanterns manufactured by these and other firms are very beautiful and pleasing in design. The high-power lanterns are mounted on columns more or less ornamental, and varying in height from 10 to 14 feet; but for ordinary purposes it is unnecessary to go beyond 12 feet above the ground-level.

## DIFFERENTIAL PRICES.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

The gas consumer is a lucky individual. If only the sale of bread, groceries, and clothing could be so carefully regulated in price as the supply of gas, and if, in addition to legislation regulating the rate of profit to be earned upon loaves of bread or joints of meat, the butchers and bakers held meetings at which the importance of low prices was insisted upon, and the ways and means thereto were discussed, and the milliners and clothiers took pains to supply the necessaries and the unnecessaries of civilized life at the lowest possible rates, and talked about binding their customers to them with golden links of justice, how much better it would be for the salaried classes? Yet for years we have had the prospect of gas engineers insisting on the sale of gas at the cheapest possible rates, and the result is the present prosperous condition of the gas industry.

But it is open to question whether the cry for cheap gas has not been repeated too frequently or with too much vigour. The British working man has been patted on the back, first by one political party and then by another, till he has become somewhat inflated with the idea of his own importance, and of his rightful position. He bears alterations of 10 or 20 per cent. in the price of coals or meat with indifference; but raise the price of gas 5 per cent., and he writes to the papers, or airs his eloquence (more often the want of eloquence) at a public meeting. He takes his regular supply of gas as a matter of right; and a very slight failure in the matter of pressure or quality raises a storm of indignation and invective that is altogether out of proportion to the way in which a corresponding defection on the part of the suppliers of other necessaries would be received by him. To say the least, he does not appreciate the efforts that have been made in his behalf, but looks upon them as entirely dictated by motives of policy. To a great extent he is correct.

But if any other tradesman, from motives of policy, took the trouble to do as much by his customers as gas companies have done for theirs, he would be lauded as little less than a public benefactor. Especially is the advantageous position of the gas consumer evident when we turn to the small, or, as some say, the poor consumer, which, in truth, do not always go together. In ordinary trading, the purchaser of an ounce has to pay considerably more in proportion than the buyer of a pound; and honest corduroy has to wait, with his money in his hand, while the shopkeeper attends obsequiously upon the carriage folks at the kerbstone. The large and the regular customers expect, and receive, considerable advantages over the small or the chance purchasers; but in the gas company's office all men are equal and all are treated alike.

These considerations have been suggested by a perusal of the paper contributed to the proceedings of the Institution of Gas Engineers by Mr. George Livesey, and the discussion thereon. The general tone is an indication that the only just and honourable course of treating gas consumers is by a close adherence to a system of one uniform rate. A small deviation to the extent of 5 per cent. would be allowed by sufferance; but anything further than this is condemned with severity, as being unjust, or weak, or ignorant. If the remarks made had been confined to large undertakings, no one would had been affected; but when put forth as a general truism for all classes of gas-works, large and small, town or country, they stand as a somewhat severe reflection upon the general practice among small undertakings of allowing discounts up to 20 per cent. or so. Certainly, there are references to exceptional circumstances. These, however, are scarcely sufficient to cover the large number of instances in which substantial discounts are not merely expedient, but capable of justification to as great an extent as one uniform rate. It is impossible to adjust the sale of gas to suit the rights of every individual customer. After every possible refinement, we cannot get further than a rough classification. Suppose we have a scale of prices according to the quantity consumed. If we have a dozen different prices, there are a hundred or a thousand or ten thousand different quantities to be covered; and there is the individual to be reckoned with who drops short by just 100 cubic feet of the next reduction. Try discount payment in fourteen days from the rendering of the account. Then there is the party who did not (?) receive his account, or on some pretext or another sends on his crossed cheque about six weeks after date, drawn for the net amount only. Or see what can be done in the way of districting—supplying the populous districts at one price, and the outlying and scattered places at another. A man who has to pay more for the gas he consumes than one across the street is at once in evidence. Let us then, in despair, go back to the uniform rate.

Now if anybody can satisfy consumers by supplying them at a uniform rate, it will be the manager of the undertaking that, from good luck or from good management, can sell at the lowest price. He is in the strongest position as being freed to a great extent from the competition that his less fortunate neighbours have to encounter. But, as a matter of fact, we find that, however low the price may be, there is still a demand for some special advantage. Few gas consumers are so well served as those of the South Metropolitan Gas Company. If there is such a thing as a satisfied gas consumer to be found anywhere, his locality should be "over on the Surrey side." But even in this Eden of gas consumers, there are signs of the trail of the serpent in the form of a customer who, under threat of introducing the electric light, asks for, and obtains, a discount of 5 per cent. By rare good fortune, this happens to be exactly the rate to which Mr. Livesey believes him to be justly entitled. If only this happy state of things could be guaranteed in every dispute as to terms of gas supply, there would not be so many big discounts; for in nine cases out of ten the big discounts do not emanate from the seller's side of the counter. If Mr. Livesey, after all he has done for the gas consumer, has to submit to discounts in order to keep out competition, what can be expected of those who, whether from fault or misfortune it matters not, have to sell at prices ranging from 50 to 100 per cent. more than those in South London, and even then cannot earn dividends exceeding 5 or 6 per cent. When the cry for cheap gas was so prevalent some six or seven years ago, many small undertakings went down to the lowest possible limit, and are now suffering severely for doing so. The recent period of dear coal and cheap residuals has tried them heavily, for consumers are not to be played with in small districts; and although the promised increase of business upon a reduction is not always realized, the loss of custom following upon an increase is unfortunately far more certain. Consequently, many have preferred to accept lower rates of dividend rather than raise the price. Mr. Livesey, Mr. Hunt, and others who can sell gas at 2s. to 2s. 6d. per 1000 cubic feet can laugh at threats that are a real menace to small undertakings. The threat to build private gas-works has no horror for them; and users of 4 or 6 horse power gas-engines do not coquet with "Dowson gas" in their districts. There is no restraint upon the use of gas engines or stoves; whereas in small towns the manager hears at least once a week some such remark as "I should use a stove, but your price is so high;" or "I was thinking of having a little gas-engine, but the gas is dear, and so I decided to go in for steam." They have their 30 or 40 per cent. day consumption, and do not know what it is to have only 10 per cent. or so and no prospect of obtaining more, except by offering special inducements to attract it.

It is scarcely necessary here to mention that Mr. Livesey's admiration for justice is generally shared, and that the majority of those who sell gas are most desirous of treating their customers fairly and honourably. There is no doubt ninety-nine out of every hundred Englishmen desire nothing but "justice to Ireland;" but, after some centuries of fruitless endeavour, they are as far from agreeing upon that point as ever. So, when we begin to talk about applying just principles to any commercial transaction, there are at least two views of "What is justice?" There are the buyers, and there are the sellers. Even if we agree upon a fair arrangement as regards any one undertaking, it is impossible to hit upon a general rule that is sufficiently elastic to cover all. It is only those who are in a sufficiently strong position to carry their points who can afford to indulge in any views of this sort. Every man who reads his newspaper has pretty strong notions upon some point or other, as to principles that should be adhered to in order to satisfy justice; but not one in a thousand can get them carried out. So every gas engineer, looking through the special glasses supplied by the circumstances of those undertakings with which he happens to be concerned, sees the problem of justice to gas consumers in a special characteristic light; and every gas consumer, actuated by the particular features of his own gas accounts, has his special views about "justice from gas companies."

The particular view of justice to gas consumers set forth in Mr. Livesey's paper, and supported in the discussion, appears very much in agreement with the view expressed by an American gas engineer, who divided the charge for gas into three parts. The first was the actual cost of the gas; the second, the cost of service—*i.e.*, wear and tear, interest, &c., on service and meter, with a share of establishment or office charges; and the third, a fair loading, as insurance people would term it, for profit. The first and third are supposed to be equal charges for each 1000 cubic feet of gas; and the second is a special charge to each consumer. As pointed out by the authority who originates it, this item is almost independent of the quantity of gas consumed, and is more affected by the number of consumers. He, therefore, proposed to fix the charge per 1000 cubic feet by the first and third parts, and to cover the second by a special charge. Mr. Livesey merges one and two as the actual cost, and then adds an equal sum to each 1000 cubic feet of gas for profit. That is the special feature of the uniform rate system. Except under strong pressure of competition, no seller of gas would care to quarrel with this arrangement, because it suits the seller better than any other. It avoids all the difficulties just mentioned, of adjusting between different quantities, day or night, light or fuel consumption. The sellers of gas as a rule prefer to get as much as they can for it. They do not scatter discounts right and left with a prodigal hand, nor have they a predeliction towards supplying John Doe at one price, and Richard Roe at another. But it appears from Mr. Livesey's paper that any departure from strict justice—*i.e.*, the particular view of justice there expressed—is something similar to giving way to drink or to gambling, and that the unfortunate board of management run a great risk of becoming involved in a gradually increasing vortex of demands for more and more discount, until at last they are swallowed up in the whirlpool of ruin. If there is any ground for this fancy picture, the annual parliamentary returns will expose it. The uniform rate undertakings will command the largest consumption per head, and pay the best dividends. Some of the differential people, on the other hand, have been practising the so-called reprehensible principle, or rather want of principle, of supplying one consumer at a less rate of profit per 1000 cubic feet than another, for a sufficiently long time to admit of the evils of the plan becoming prominent, and should have begun to suffer some of the consequences of their action.

Unfortunately, however, for the comfort of rental clerks and gas engineers, and for the relief of directors, the uniform rate, however low, does not always get rid of that troublesome individual who happens to live on the wrong side of the street. Particularly in small districts, the difference between the quantity of gas used at the factory, at the railway station, or public institution, as compared with the consumption of the ordinary shopkeeper or professional man, is so great as to admit of two separate and strongly distinct classes being clearly marked out. The large consumer has something to say from his point of view. With regard to the regular tax per 1000 cubic feet of gas, he argues that no one would expect to pay 25s. per 100 for cigars that are retailed at 3d. each, or to buy beer or spirits by the barrel at a price proportionate to that at which they are sold by the pint; that a grocer sells tea by the pound at a 20 per cent. profit, but would be glad to do business by the hundredweight at 10 or even at 5 per cent.; that an agent or auctioneer has a variable range of commissions—say, from 5 down to 1 per cent.—according to the amount of the turnover; and, in short, that it is a recognized principle in all branches of trade, to give the large buyer a substantial advantage over the smaller one. From which he deduces, with much force, that the purchaser of gas by the million cubic feet should not be loaded with a *pro ratâ* profit as compared with the purchaser of 1000 cubic feet.

# TECHNICAL RECORD.

## NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

### The Papers and Discussions at the Dundee Meeting.

The following is a report of the discussion on the papers read by Messrs. Young and Bell at the above meeting, the text of which was given in the JOURNAL last week.

Dr. STEVENSON MACADAM (Edinburgh) said he would have preferred that some practical man should have opened the discussion, so that he might have had an opportunity of stating his views on the subject before the meeting. It was one with which he was very familiar; and it was also one which he thought he ought to congratulate the Association on having made their own. The fact was that twenty-one years ago—they were now in the majority of the question—he had the honour of bringing the matter before the Association, at a meeting which was held in Perth in the year 1872; and it was then a subject which was more concerned with scientific inquiry than with what they might regard as practical use. In the interval, however, they had had the thing threshed out in many ways, with the result that they had had a great deal more light thrown upon it; and he was very glad to find that in this, the majority year, it had become a thoroughly practical question. The observations made by Mr. Young were extremely interesting on the general principles connected with the breaking up of the oils, either into more useful and thinner oils, or into permanent gas; and he did not know that there were any points—there were certainly none of greater importance—as to which they would differ in regard to the constituents in the breaking up. Consequently, his observations would be more in the way of requiring, or at least of asking for, fuller information respecting the paper which was read after Mr. Young's communication, and which was the practical one. This subject had been experimented upon, not only in the chemical laboratory, but also with large apparatus, on a practical scale; and he had to do, from time to time, not only with the carrying out of his own experiments, but with the taking of very careful superintendence, and accurately estimating the results which had been obtained by some practical methods. And he had to say this—that he was quite agreed, in the first instance, with the prominence which was given to blue oil as the one which could be best employed in the production of this gas. He also agreed, practically, with the large proportion of gas that was obtained from the blue oil, and the quality of the gas. The fact was that, when this matter was in its infancy, the question arose as to the kind of oil to be employed in experiments for the production of permanent gas. He worked with all kinds of oil—not only with crude, but also with green oil, which was a sort of semi-refined material; and they ultimately came upon the blue oil, some fifteen years ago, as that to which they should confine their experiments. It was then a sort of drug in the market—at all events, it was a material which could be purchased at a reasonable price. Further, it had the advantage of being purified to a considerable extent, in respect of the tarry matter being taken out of it. They found that the results they obtained, and the photogenic value, were very good; and consequently he was pleased to see the results obtained from the blue oil in this process. The question as to the breaking up of the oil into permanent gas was one which they might say lay at the foundation of the whole subject. In the earlier experiments—those which were conducted twenty-one years ago, and which were necessarily only early experiments—they had to work without knowing very well the modes of operation at the time. In all these earlier experiments, the method of working was to pass the oil over—dropping it on to—a red-hot material, and to send it through a red-hot material, to vaporize the oil, and then to transmit it, in vapour, through a hot substance such as coke. Those who cared about investigating the matter would find it in the Transactions of the Association for 1872.* Those experiments yielded a considerable quantity of permanent gas; but they did not give the larger proportion which was now obtained. They had a gas which had not so high an illuminating power, and one which had not such permanency in regard to retaining its illuminating power. For instance, on the second day, condensation had taken place, and the quantity and quality was much reduced; and on keeping it for four days, it was still further reduced. But after these earlier experiments, there came the question of breaking it up, without passing it through a body of red-hot material such as coke; and in all the later experiments, as regarded the last fifteen years, which he conducted himself, and which he had seen conducted and taken note of in every way, they had had the substance broken up practically in what Mr. Young referred to as radiant heat. It had not been transmitted through any body of red-hot material in the form of vapour, nor had the vapours been allowed to impinge upon a large body of red-hot material. The consequence had been that the principle upon which these oils should be broken up had been conducted, so far as he knew for the past fifteen years, in regard to the product which was obtained, by the process now described to them. That product was one to which he should wish particularly to refer—the quantity of gas and its illuminating property, and how far they had extracted out of the paraffin oil the photogenic power which the oil was capable of yielding. In such cases, of course, the mere quantity of gas could not be taken as the only factor; they must likewise consider the photogenic power—the light-giving power—of the gas. He found it was stated in the table that the candle power, very properly expressed as an enriching agent, was 90 candles. Of course, this was enrichment, which, if there had been time, the author of the paper would have clearly explained. This enrichment was not actually the light-power of the oil gas they obtained by the process, but was the light-power they had when they mixed it with thinner gases, and then determined the photogenic power of the mixture. Practically, the result—and Mr. Young would bear him out in this—was that he obtained 60-candle power gas from his apparatus; and then he had very properly put it there that the enriching power went up to 90 candles. This arose from the fact that the gas was so very rich in the heavier hydrocarbons that, in order to consume it properly, and get the full luminosity out of it, they required to burn it with a poorer gas. A much easier method of calculating the productions was to take the sperm value. This was given as 6635 lbs. of standard sperm candles per ton of the oil they employed. This, of course, was on the enrichment theory; and it was an enrichment fact, because he quite admitted the enrichment. Well, then, that was the full quantity of light they obtained when they mixed it with thinner gases. But if they took the gas by itself, they, of course, had to reduce it from the 90 to the 60 candles; and this brought down the sperm value to about 4500 or 4600 lbs. Now if he compared the amount of light obtained by this process with that which was obtained by other methods he had thoroughly investigated, he found that practically the same result was arrived at; and he did not see where there was any great increase of light-power in using this apparatus, as compared with others. He was not, at the moment, concerned with the working of the apparatus, which was a question for practical men; but the result was that, using other practical methods, they obtained as nearly as possible the same amount of light as was shown in the table, and working, let them remember, with a similar oil. He wanted to be very careful about this, because there might be what was called blue oil and blue oil; but the oil he was working with was of ·877 to ·878 specific gravity, so that it was practically a blue oil. It was very important to consider the illuminating power with regard to the quantity of gas, and the illuminating power they had from the gas; still he could not see where a much better result was obtained, practically, so far as regarded the light-power they had from their blue oil. Another point to which he should like to refer was the influence of what was called distilling at a low temperature, and then re-distilling; or what he might call re-churning the material over and over again. He was not so sanguine as Mr. Young and Mr. Bell seemed to be as to the great benefits to be derived from this. They had the oil split up, and only partially (as they all admitted) converted into permanent gas. In great part it was condensed in the apparatus, and flowed back to the retorts. In considering this point, they had to take along with it the large amount of carbon which seemed to be deposited in the Young retorts. It was 5½ cwt. per ton of oil. This was an enormous quantity of carbon. He did not know how far it came from the actual oil employed, or whether it was obtained from those products which had been condensed and run back into the retort. It was probably more from this than from the actual new oil which was run in along with it. But this proportion of carbon appeared to him to be extremely large; and whether or not Mr. Young's process were ultimately adopted as the best, he thought they must have a modification of it, so as to try to reduce this large quantity of carbon. There seemed to be an enormous amount of waste, when, in distilling a ton of material, more than 25 per cent. was left as black carbon. They did not care whether it was very suitable for firing or for other purposes. What he wanted was to convert it into illuminating gas; and he thought it would be their duty to endeavour to reduce the carbon as much as the authors could. He had only one word to say further, in respect to the different oils they found suitable. A crude shale oil did not yield them so large a result as in Mr. Young's apparatus. Of course, it contained a lot of very light liquids, and also tarry matters; and these reduced the possibility of converting it into permanent gas. While making these observations, he wished to say how much pleased he was that Mr. Young and Mr. Bell, and other practical engineers, were devoting their attention to the important subject before the meeting. He quite agreed with them that it was one in which lay the future of the enrichment of gas at a reasonable cost; and therefore the more it could be brought before them, and the more thoroughly they discussed it and threshed it out, the better it would be for the manufacture of gas.

Mr. J. HEPWORTH (Carlisle) said he did not propose to discuss the papers, to which they had listened with much interest; but there were one or two questions which he would very much like should be answered. In the first place, he wished to know whether any experiments were made with Russian oil, and what the results were in comparison with those shown in the table before them; and since no figures had been given as to the commercial value of the process, perhaps Mr. Young or

* See JOURNAL, Vol. XXI., p. 763.

Mr. Bell would say what quantity of gas per mouthpiece could be produced per 24 hours. He should also like to ask whether, especially in the last experiment there detailed, with splint coal tar, the retorts used were of clay; and since the quantity of coke from this experiment was considerable—13·61 cwt.—he presumed they might take it that the value of the coke was at least as good as that of the coke produced from ordinary splint coal. He thought, if they had answers to these questions, it would help them very much in arriving at some conclusions which were important in this matter.

The PRESIDENT (Mr. T. D. Hall) intimated that, as they would possibly have so many questions, perhaps Mr. Young would like to answer them at once.

Mr. YOUNG said he would be very pleased indeed to do so. As regarded Russian oil, he might say that they had not tested any of it on a scale upon which he would care to give any definite results. They had made experiments, but the results that had been given to the meeting were those which they had obtained upon a practical scale; and he would not like to come before them with experimental results. With regard to the tar, their contract prohibited them from using it up to a certain time. They had now used all the tar they had made; and the way they had utilized it was simply to collect it, and pump it into an elevated tank, and they used the existing brick retorts at first, by simply filling the mouthpiece with a piece of brick, with the object of compelling the tar to flow on to the heated surface of the retort. They found this to work so well, that they immediately took out one of the settings, and placed the new retorts on an inclination of something like 4 inches upon the 9-feet retort. This had the effect of causing the tar to flow back, and prevented the nuisance they had in its lodging in the mouthpieces, and giving trouble when taking off the doors. The results obtained had been arrived at in this way: In the first place, they took the quantity of gas which they had been getting from the splint coal previously; they then took a quantity of tar, and worked it in separate retorts, but measured the resulting gas in conjunction with that obtained from the splint coal, and calculated out the augmented volume and the increased illuminating value realized by the use of tar in that way. Then, as a check experiment, they fitted up a retort which could decompose a gallon of tar in an hour; and they carefully measured the gas. They collected the whole quantity, and made an analysis of it. They found the results were substantially identical with those they had obtained on the commercial scale; and they then thought themselves fully warranted in giving those with regard to the value of the coke from the tar. The coke came out with a ringing sound. It was quite hard; and it was thoroughly bound together in a mass. It came away perfectly free from the walls of the clay retort. A very large shrinkage took place; and it was just as easily removed from the retort as if a charge of coal had been put in. Of course, they could judge for themselves, from the very appearance of the coke, as to its value as a fuel. They had to check the draught; otherwise they would melt down the whole setting. By simply keeping the draught a little lower, they obtained the desired temperature. They found that the more frequently the oils were subjected to decomposition, the better the results; the smaller the increments in which the oils were decomposed, the higher were the results. Then with regard to the quantity per mouthpiece, they had a letter from Mr. Scott, of Galashiels, in which he said: "We have now had a nine weeks' trial of the oil gas, and during the whole time it has given entire satisfaction. There never has been a single hitch since we commenced. I may mention that, by way of experiment, we raised the heat on Friday and Saturday last, to see what quantity of gas we could make. We were then making 4000 cubic feet per mouthpiece per 24 hours; and with the increased heat we made 6000 cubic feet in 12 hours, which, I am sure, will answer our purpose in a push during the winter months."

Mr. D. TERRACE (Middlesbrough) said he had not intended to speak upon these papers, because of the position in which he was placed. It was not at all likely that oil would bear such an important part in England as it would do in Scotland, because an increase of 5 candles would be of more importance to managers in the latter country than a single candle would be to them in England. But he was very much interested in the lower line of the table—to think it was possible, from the tar which they almost gave away just now, to get the sperm value indicated. If they added this to what they obtained from the coal originally, it gave them nearly four times the sperm value of the coal—a result which, he thought, appealed to all their senses. If they could possibly convert all their hydrocarbons into light, it would be a great gain. With regard to what Dr. Stevenson Macadam had said about the carbon left in the retort, he thought they would much rather have it in this form than as soot, which they used to have. Mr. Young seemed to have been able to convert it into carbon instead of into soot; so that whether or not the quantity of real coke were excessive, he should say they would all have it in that way than otherwise. He understood this was in reality the *crux* of Mr. Young's paper.

Mr. A. YUILL (Alloa) remarked that there was one question he should like to ask—viz., about the volume of coke produced per ton of oil. Dr. Macadam seemed to have thought 5·7 or 4·9 cwt. excessively high. Dr. Macadam might know that, in dealing with hydrocarbons, in the opinion of some, before they were able to split up the gases, they must separate a percentage of carbon. What he would like to ask either Dr. Macadam or Mr. Young was, if they could give them any idea as to the minimum percentage of that decomposition. If it were not possible to do away with the carbon altogether, then what was the minimum percentage of carbon they could possibly get?

Dr. MACADAM replied that he could not give this in exact figures; but he might say that, in the experiments he had made on a practical scale, they had nothing like that proportion of a fourth of the material left. The question arose as to the minimum; but he had seen these retorts, after working for twelve hours, taken out, and simply a little carbon scraped out of them. Of course, he quite understood that, in the circumstances to which he had referred, a considerable proportion of the carbon was passed off in the form of smoke, which was condensable in the condensers; but his own impression was that 25 per cent. of the original material was excessively high.

Mr. A. MACPHERSON (Kirkcaldy) said they must all feel very much indebted to Mr. Young and Mr. Bell for the papers they had given them; and he was sure this oil-gas process would, sooner or later, take its place in the gas-works of the country. Suppose it were for nothing else than as a stand-by, they would be justified in introducing it; but if its merits were so conspicuous as they had been told that day, he thought they would adopt it as a means of enriching poor gas, and thereby enable them to check the price of high-class cannels. With regard to what Dr. Macadam had stated, he thought he had proceeded upon a wrong basis as to the 90-candle power. He (Mr. MacPherson) understood that the illuminating power was in reality 90 candles. Then, with reference to Mr. Yuill's and Dr. Macadam's question with respect to the coke which was left, he had no doubt that a limit must be found. They could convert a certain amount of the hydrocarbons into permanent gas, but the process necessarily involved a deposit of carbon; and while Dr. Macadam said that he had much less coke, what about his tar? They had no oil tar in this system. But he thought Dr. Macadam would find he had a considerable quantity in his process; and possibly, if the tar were added to the weight of the coke, it would be found that they would not be very far apart. The only drawback he could see to the process was that the whole coal they would use would be coking coal, and that they might have some difficulty in disposing of the coke at a reasonable price; and where, as was generally the case, the space in gas-works was very limited for the storeage of coke, this might be a very serious drawback. He thought that, in estimating the commercial value of the gas, the value of this coke was taken at from 7s. 6d. to 8s. 4d. per ton. If they augmented the coke they had for sale by something like, he should say, three or four times the quantity they had at present for disposal, he did not see where they could find a very ready market for it; and consequently, if they did not get a ready market, they could not receive anything like 7s. 6d. or 8s. 4d. per ton. In estimating its commercial value, they would require to judge of its value according to particular circumstances; but in regard to the process for the conversion of oil into a gas for the enrichment of coal gas, in his opinion Mr. Young had solved the difficulty in a unique manner.

Mr. YUILL said, as one of those who were taking up the oil process, he might state that he had been looking out to see how he could get the coke disposed of; and, on making inquiries, he found that what they required in iron foundries was a hard, dense coke, with a low percentage of ash. The thought struck him that the coke produced by the Peebles process contained all these properties. At present, iron-founders were paying 22s. per ton for ordinary coke, with 2 per cent. of ash; and they were quite willing to take the coke produced by the oil-gas process, as soon as they started to make it, and pay 20s. per ton for it.

Mr. D. M. NELSON (Glasgow) remarked that their friend Dr. Macadam had drawn attention to the enormous quantity of coke that was left as a residue by the Peebles process. Some of those present would remember a little newspaper correspondence he had as to that; and he thought it due to his friend Mr. Young to say that, being engaged in a matter in which the result was to produce the highest quantity of gas, this prompted him to call in question Mr. Young having so large a residue as 5 cwt. of coke per ton of oil. In the correspondence, he also called attention to the fact that the coke did not burn. He found, however, that the piece of coke he had in his hand was very different from the coke Mr. Bell sent to him.

The PRESIDENT: That is tar coke.

Mr. NELSON said he was very glad he had raised the question, because it made the matter clear; and he found that others beside himself had been of the same way of thinking. The coke he had now possessed more of the density of that which he had sent to him from Peebles. The point he was dealing with was the fact that so much of the coke was left, and, instead of being converted into gas, which was really the business of the man engaged in enrichment, that it should be relegated to the parlour fire. He found, upon the authority of their friend Dr. Macadam, that he could not have been very far wrong, because they should take the most out of the material that was furnished to them. He was quite certain Mr. Young had ingenuity and skill enough to do this, if any man could do it; and he thought it due to him, to say that it was from no spirit of fault-finding, but with a desire that the coke should be converted into gas, that he wrote what he did.

Mr. A. BELL (Dalkeith) remarked that he would very soon be in the position of having had experience of the Peebles process, because they were busy erecting the plant for it. Dr. Macadam had stated that the blue oil he used was semi-refined. His (Mr. Bell's) experience was that they did not wish for refined oil, and that any unrefined oil would do. The former, by being washed with sulphuric acid, must contain sulphur, which crude oil would not. Then, with reference to the coke, their friend Mr. Nelson had not yet got the "grip" of that. When carbon was contained in the oil as a liquid hydrocarbon, they did not want it in that condition. They were not oil manufacturers, but gas manufacturers; and to make a gas suitable for burning, they must take out a quantity of the carbon. This was the carbon which could not be made into gas. It could not be a working gas and contain this excess of carbon. With reference to the burning properties of the carbon, of course it was perfectly suitable for burning, only it must be broken small. He presumed that Mr. Nelson could not burn the sample sent to him because he did not break it. Dr. Macadam said that he had never obtained 5 cwt. of coke per ton of oil. He (Mr. Bell) granted that; but Dr. Macadam never worked in that particular manner. He worked, he supposed, in a small experimental way. A portion of his coke went away as tar, and also, as Dr. Macadam himself owned, as smoke. As gas manufacturers, they did not want this. They knew where it went to; it choked up their ascension-pipes and everything else. They wanted it in some portable form, in which they could take hold of it. They did not wish to have it spread all over their works. At Peebles he had had the pleasure of seeing the process at every stage. He had watched it very carefully, not only in the retort, but throughout; and he had never found anything in the boxes. He was able also to state that everything that had been put before the members that day was correct.

Mr. R. MITCHELL (Edinburgh) observed that this was a subject in which he had taken very considerable interest since it was started; and perhaps he might be permitted to lay before the meeting the result of some experiments which were conducted on his instructions at Peebles. The question had been asked of him as to what was the cost per 1000 feet of gas made from the oil used in the apparatus; and he would read the following passages from his report to his Commissioners:—

> I have prepared a statement showing what I would consider as fair average costs for enriching coal gas from 16 or 18 to 30 candle power. One ton of coal, producing 10,000 cubic feet of 16-candle gas, costs 10s.; deduct for tar and liquor, 1s. 8d.; coke, 1s. 3d. = 2s. 11d.; net cost of 10,000 cubic feet of 16-candle gas, 7s. 1d. A thousand cubic feet of 16-candle power gas costs 8·5d. One ton of ·891 specific gravity oil = 251 gallons, costs £2 10s.; deduct for coke, 5·18 cwt., at 20s. per ton, 5s. 5d.; net cost of 251 gallons of oil, £2 4s. 7d. One gallon = 92·64 cubic feet of gas, costs 2·132d.; 1000 cubic feet of oil gas cost 23d.

He had a table there, showing the difference in the cost of the various qualities from 16 up to 30 candles. In the closing paragraph of his report he said:

> In conclusion, I may be permitted to state that I am of opinion that this process is destined to become an important factor in gas-works where a high illuminating power gas has to be supplied, and is well worthy the consideration of the Commissioners whether a trial apparatus should not be erected at their works.

Since this report was laid before his Committee, plans had been prepared, and were now completed, for the installation of altogether 21 oil-retorts on one side of the bench, and 28 ordinary fire-clay retorts on the other, which could be employed for the distillation of coal or the breaking up of coal tar into gas, so that they would be able to know exactly the cost of it, and the advantage of the application of it; and he hoped he might be able at some future time to lay before the Association the benefit of his experience in this direction.

Mr. J. M'GILCHRIST (Dumbarton) stated that, as Dr. Macadam had pointed out, they had had twenty-one years of oil gas; and while, previous to last year, they were somewhat sceptical as to the use of oil for gas-making purposes, he thought that oil gas was now within "the region of practical politics." He considered Mr. Young had, to a large extent, solved the problem of how to make oil gas. That gentleman was no novice in the matter of manufacturing gas from oil, because a number of those who were then present had been associated with him for many years in the work. They began in a very crude way; but they had worked up to what might almost be called a perfect system. The only thing was, Would it pay? This was the great difficulty. While they talked about the production of coke being in the wrong direction, he did not think that, when this process yielded a coke which could fetch in the market 20s. per ton, they could call it altogether a waste product. Indeed, he considered they might look at it in the other directions. But the question came in, if they were all going to use oil in the manner which had been advocated that day, would it remain at 2d. or 3d., or even, as the President had said, at 4d. per gallon? They knew very well that the law of supply and demand would come into play; and if oil came to be beyond their reach, the plant they might erect at their different works would be of very little use. They were told that large supplies of oil might be obtained from Russia. He trusted that some of the gentlemen who had taken up the new plant would thoroughly test the Russian oil, and possibly, if it were as successful as Scottish oil, they would have less hesitation in deciding as a body to adopt it. He thought they would all wait to hear the result—possibly next year. Their friend Mr. Mitchell had just promised a paper on the results to be obtained in the Edinburgh works; and he had no doubt Mr. Yuill and others would be able to give them the results of their working. If there was a fault in the papers they had heard, it was, in his opinion, that the authors had given the meeting nothing to lay hold of in the matter of cost.

The PRESIDENT remarked that he would very much like to hear Mr. Tocher, of Peterhead, make a few remarks. Mr. Tocher was kind enough to explain Mr. Mackay's paper most thoroughly to them last year; and he thought he would be able to say something interesting on the new development of the oil-gas process.

Mr. TOCHER said he was very much interested in the discussion, as well as in the two valuable papers given by Mr. Young and Mr. Bell. It had, without doubt, entailed a great deal of experiment to arrive at so satisfactory a process; and the results it gave were excellent. A yield of 21,500 cubic feet of 90-candle gas per ton of oil was certainly satisfactory. He wished to ask if Mr. Young had tested the candle power—the photogenic value—of the oil gas alone, and found it to be 90 candles.

Mr. YOUNG said he might state at once that the 90 candles represented the gas when burnt at the rate of 5 feet per hour.

Mr. TOCHER went on to say that the adoption of the process would entail the erection of special plant; and this might cause gas managers to wait until a favourable report was given by those who were trying the process. Mr. Mackay had laid before them the results he had obtained Without, of course, professing to be a process at all like Mr. Young's, Mr. Mackay's method was more simple, and it effected its purpose, which was to produce economically and at any time, a gas of high illuminating value, without interfering in any way with existing plant, and without damaging the tar. Last year, at their President's request, he made a few remarks regarding Mr. Mackay's mode of working; and at that time he spoke of the probability of imperfect gasification being the cause of some of the difficulties they had to contend with. There was now no doubt whatever that the larger the proportion of oil was to the ton of coal (one mouthpiece only being used), a portion of the oil passed over unchanged; and this caused the apparent discrepancies in the candle power given at the time. This had now been obviated by injecting the oil very slowly, and at a higher pressure, into the retort. He did not notice anything very remarkable in Mr. Young's process as compared with Mr. Mackay's. They expected to give some further results at that meeting; but they had both been prevented from doing so by pressure of other work. They hoped, however, to be able to have them by the end of the year, and to have formed an opinion as to the yield by Mr. Mackay's method, which was not very much of a process, but merely an application.

Mr. D. VASS (Portobello) said he should like to ask Mr. Young a question with reference to the retorts. No figures had been given as to the cost. The retorts used at Galashiels were cast iron. Would there be much difference in expense in using steel retorts instead; and would there be any greater durability in them? Then he should like to know if there would be any danger from a cracked retort. The material at the end of the charge, prior to drawing it, was in a liquid state; and, in the event of the retort cracking, there would be a few hundredweight of liquid matter in the retort. If a retort were cracked in the bottom, would this be a source of danger? or would it be a source of danger if there were condensation, producing a vacuum? Then there was one point in Mr. Young's paper which struck him as being applicable to existing plant, and that was the action of water in shale—water in the presence of hydrocarbons. He had never understood water in shale to have such a deteriorating effect. They had understood the effect, but not how it came about. The reason for their having such bad results from working with wet shale, more so even than when working with wet cannel or splint coal, was very well brought out in Mr. Young's remarks.

Mr. A. BELL (Dalkeith) said, with reference to the extra cost of the plant necessary for the process, he might state that a gentleman had proposed to erect the plant and take his payment out of the savings for a year. This showed that the additional expense should not interfere very much with the adoption of the process.

Mr. A. WILSON (Dawsholm, Glasgow) thought that the members were all very much obliged to Mr. Young and Mr. Bell for bringing before them the subject at present under discussion; and the Association as a body was indebted to them for reserving their papers for the present meeting. Mr. Young's remarks showed that a master was dealing with the subject. It seemed to him (Mr. Wilson) that the great point about the Peebles process and about the apparatus was the workability of it. The whole thing, from beginning to end, was thoroughly under command. The results were certainly exceedingly good; but still he thought, in the matter of illuminating power, there was a point which wanted clearing up. As he understood it before, the illuminating power stated was only obtained by mixing the rich oil gas with ordinary gas; if the gas were tested by itself, he did not think they would get 90 candles. This was the impression he had before.

The PRESIDENT: That is admitted; it is impossible to test a gas of that power.

Mr. WILSON (continuing) said this made the matter quite clear, because it was plainly shown on the diagram that the gas was

taken as an enriching agent; and, if they tested it by a photometer, he did not think they could get the illuminating power stated. There was a question raised by Mr. MacPherson about the coke. He (Mr. Wilson) did not think there need be any fear of not getting a sale for the coke. If they could use oil, and do without cannel or shale, the coke would be of better value, and be more easily got rid of than now. The cost of the apparatus was not very great; and to him the crucial point in the matter of cost was what the price of oil would stand at. If the oil would keep at a reasonable figure, he did not think there need be any fear of the system not coming into general use. Of course, taking it on a large scale, it might not be so suitable for big works, where space was a great consideration. The floor area for a system of this sort must certainly take up a large portion of the works—quite, or very nearly, as large as was required for producing the same amount of gas by a coal-gas plant; and it was just a question, where space was much wanted, whether a water-gas system, enriched with oil, would not be more suitable. But, of course, this again was a question of cost. Perhaps by the time they met next year, if the subject was brought up again, they might have further light upon it.

The PRESIDENT thought it would be presumption on his part to attempt to add anything to the two excellent papers they had heard, and the most interesting discussion which had followed; but possibly he might be allowed to ask a question. It had been put to him several times in this way: Should they carbonize oil, or should they not go straight for the shale—put the shale into the retorts, and carbonize that, instead of making two processes of one? He could see through this argument. For instance, if they took the shale and carbonized it, they could only produce a gas, at its very highest, of about 40-candle power; whereas if they took the shale in its condensed form as oil, they could make gas of twice this quality—of, say, 80-candle power. He should like to ask Mr. Young this question: From a ton of oil they could produce about 22,000 cubic feet of 80-candle gas. While it would hardly be fair to put a ton of shale against a ton of oil, perhaps Mr. Young could give them a statement as to how many tons of shale it required to produce gas equal to that made from a ton of oil, and tell them what they would gain by carbonizing the oil in its condensed form, instead of going straight for the shale. He supposed that the oil-retorts took up the same space in comparison with the coal-retorts; but they must look at the extra work they obtained from an oil-retort. As Mr. Young had stated, they could make about 12,000 cubic feet of gas per 24 hours with one oil-retort; and he did not believe they could approach this quantity with a clay retort, in making gas from coal. Then there was the coke difficulty. He did not think that, as far as they could see, judging from the quality of the coke, there should be the slightest trouble in disposing of it; and he thought that, when they considered that from a ton of oil—and Mr. Young would tell them later on how many tons of shale this represented—they obtained 5 cwt. of coke, this was not a very large quantity to be left over. As Mr. Yuill had indicated, they must have some residue, unless they could introduce into their retorts some medium to carry forward the deposit of carbon which the gas was not capable of carrying with itself. He must say that, as far as the burning of the coke was concerned, he had, like Mr. Bell, of Dalkeith, tested the coke; and he could assure the meeting that it quite satisfied him. He had not the slightest difficulty in burning it; and, from what he had read and heard, this oil coke (or "still bottoms," as it was quoted in the market) had been a saleable commodity in the coal market of Glasgow for the last fifteen years, and was largely used for raising steam for yachts. It was compact, and possessed a high heating power; and it gave off no smoke. If they became manufacturers of the coke, supposing it should come to be a residual in their works, the price which they would receive for it—20s. per ton—would, he thought, recoup them, although they might have to stop the process for a month or two to get quit of the production. Then with regard to the spraying process, no doubt there was also a future in store for that. Mr. R. Herring, of Dover, had gone extensively into this, and had invented and patented very complete plant for spraying oil.* No doubt most of them knew the plant, which was inexpensive and workable. There was no doubt that, when it came to be a question of enriching (say) 15-candle gas from common coal, possibly the spraying process might be found more useful or applicable to add one candle to the quality of the gas; but if they came to enrich 17-candle gas up to the Scotch standard of 26 candles, he questioned very much whether they should, or could, do this by spraying. He saw no difficulty in adding a candle or two to the illuminating power of a poor gas; but he was afraid spraying would be found incapable of raising it 9 or 10 candles. Mr. Young had replied to the question with regard to the testing of the oil gas. For the gas they obtained from a pure oil, to burn by itself, no burner had been invented; or rather there was no burner in existence that could consume 5 cubic feet of this oil gas in one hour. Consequently, the oil gas had to be diluted with coal gas before they could test it in the photometers as they were made at the present day. He did not know that he had anything further to add; and therefore he would call upon Mr. Young and Mr. Bell to reply to the different speakers.

Mr. YOUNG said he was very pleased indeed that a gentleman having so large an experience of the subject as Dr. Stevenson Macadam possessed, should agree with him on the general principles he had advanced relative to the production of illuminating gas from hydrocarbons. However, Dr. Macadam took exception to one of the principles—that of decomposing the oil frequently, in successive stages, instead of at one single operation; and he doubted whether, by the decomposition of the oil in this way, the same illuminating value, in the form of gaseous compounds, could be obtained from the oil distilled frequently. He gave as his reason for coming to such a conclusion that the quantity of carbon eliminated in the solid form by the process was in excess of what his past experience would lead him to believe was the case in decomposing oil at a single operation, and at high temperatures. There were two ways of taking the value of the result arising from the decomposition of oil during the process of gasifying it. Dr. Macadam had taken the weight of the carbon as the sole guide in coming to his conclusion regarding the process. He (Mr. Young) proposed to take, as the basis of his argument, the weight of gas obtained, and its specific gravity. It was somewhat difficult to get at the weight of the coke and tar resulting from the process; but there was no difficulty in correctly measuring and taking the specific gravity of the resulting gas, and from these factors calculating out its total weight. He had looked over a great many analyses, giving the production of gas from various oils, by Dr. Macadam and others, which had been published in the Transactions of English Associations. He had carefully calculated out the weight of the gas obtained, and in no case was there a greater weight than 4¾ lbs. per gallon of oil. The difference between the weight of the gas obtained and the weight of the original oil from which the gas was produced must have gone somewhere. If it was not left behind in the retort, it must have assumed some other form elsewhere—probably soot and tar. By the Peebles process, however, the gas obtained per gallon of oil weighed from 6 to 6¼ lbs.; and the difference between that weight and the weight of the original oil was left in the retort as good hard coke—no tar whatever being made. These results had been very carefully verified; the volume and the specific gravity of the gas being carefully noted, and the coke as quenched was weighed, month after month, at the Peebles Gas-Works. Then, with regard to the high results referred to by Dr. Macadam as having been obtained from the decomposition of oil in previously existing apparatus, he had to remark that he had not the slightest doubt that such results could be obtained with a process of decomposing oil carried on under the careful supervision of one so skilled as Dr. Macadam. He did not think, however, that Dr. Macadam, or any other gentleman present, could point to a practical process, in the hands of ordinary workmen, by which such results could be achieved as those which had been obtained by the Peebles process in practice, and by which the oils could be wholly decomposed into such high-quality gas—leaving the carbon in the retort in the form of a good solid coke such as they saw before them. With regard to the difficulty likely to be experienced from the large amount of coke resulting from enriching gas by the Peebles process, instead of shale, it was not the quantity of coke produced from the oil to which Mr. MacPherson had referred, but that produced from the splint coal employed to make the poor gas to be enriched. Undoubtedly this would, in some cases, prove to be a trouble; but it should be also kept in mind that the coke from splint and similar coals was of a superior quality, and would command a market where cannel coke would not. There would certainly be no difficulty in disposing of the coke resulting from the oil. In the paraffin oil industry, with which, as they were aware, he had been for a very long time connected, there was produced, in the process of refining oil, a very similar coke to that obtained by the Peebles gas process. Such coke was regularly stored up in the oil-works during the winter months, and sold at from 30s. to 35s. per ton for use in firing steam-yachts in the course of the summer. The next point that called for attention was the illuminating power of the oil gas obtained by the different processes alluded to. He had to remark that, even allowing that the same volume of a like quality of gas had been obtained in the past by other processes as that resulting from the Peebles system, it did not necessarily follow that these gases would have the same enriching value; for, as was now well known, the illuminating power of a gas resulting from the mixing of two illuminating gases, or of an illuminating and a non-illuminating gas, was not the mean of the illuminating power of the mixed gases, as would be indicated by simple calculation, but might deviate a considerable way, either above or below what calculation would indicate, dependent upon the interaction upon each other of the mixed gases. For instance, if they took marsh gas, they were aware that, by itself, it had an exceedingly low light-giving value. By careful "nursing," it might be made to have an illuminating power of (say) 5 candles. When, however, it was associated with a hydrocarbon gas having a high illuminating power, there was developed, by the interaction of the gases, an illuminating value far in excess of that which mere calculation would indicate; and he had no doubt that, by mixing gases having the same high illuminating power, their light-giving properties were derived from different classes of hydrocarbons. With marsh gas, although it might be mixed in exactly the same proportions, varying results would be

* See JOURNAL, Vol. LX., p. 770.

obtained. Now, by cracking up the oils frequently, at comparatively low temperatures, in the way described, a different series of hydrocarbons was produced than when the same oil was cracked up all at once in one operation. Professor Lewes, who had made an analysis of the gases produced by the Peebles process, showed that the hydrocarbons present were principally olefines, and that only an exceedingly small quantity of the benzol group were present. On the other hand, it was well known that oil gas made at high temperatures owed a considerable part of its illuminating power to the benzol group; and he had little doubt that the difference in the constitution of the oil gas obtained by the Peebles process was the cause of its higher value as an illuminating agent. The question had been asked whether it would not be more economical to carbonize the shale direct, instead of distilling it first for oil, and decomposing the oil into gas. There were a great many factors which came into play and affected this question. In the first place, the shales that were used in the mineral oil industry contained a small quantity of bituminous matter, and yielded only from 20 to 30 gallons of oil per ton. This quantity of oil would give between 2000 and 3000 cubic feet of gas—gas, however, of an exceedingly high illuminating power. If the same shale were carbonized direct, it would produce double this volume of gas. But, owing to its bituminous constituents being decomposed in the presence of water vapour, as well as to other causes, the illuminating power would not be one-half of that obtained from the oil. In other words, the 2500 cubic feet of oil gas obtained by decomposing the oil would have a greater enriching value than the 5000 cubic feet resulting from the direct carbonizing of the shale. Then, again, the conditions obtaining in shale-oil works were different from those in gas-works. As a rule, the retorts used for the distillation of the shale were placed in the immediate vicinity of the mines; and, in the majority of cases, the shale raised from the mines was tipped from the hutches into the shale-breaker, and crushed to the desired size—an operation requiring no more labour than that which would be needed to load the waggons had it to be sent to a gas-works. From the breaker the crushed shale was run on to the top of vertical retorts, into which it was tipped. In the upper part of these retorts, the shale was distilled at a low temperature for oil; and the resulting coke, or rather residue, thereafter dropped into the lower part of the retort, which was raised to a high heat. Then the residue was brought into contact with steam—the high temperature of the retort enabling the carbon present in the residue to decompose the steam into water gas; and as the carbon of the residue contained nitrogen in its constitution, there was produced a quantity of ammonia equivalent to from 20 to 40 lbs. of sulphate per ton of shale. The exhausted shale then dropped by gravity to the bottom of the retort, and was sent to the *débris* heap. The cost for labour in working the shale came to something like 9½d. per ton. Their friend Mr. West was able, with his arrangements, to perform the work of carbonizing coal at an exceedingly low cost; but he did not think he could do the whole of this work for 9½d. per ton of coal. It was also to be noticed that shale was a much more difficult thing to deal with than coal. He understood that Mr. West had had some practical evidence to this effect during the installation of his system in the gas-works at Aberdeen. He (Mr. Young) had no doubt that, in the majority of gas-works, it would probably cost three times as much to carbonize shale as it did in oil-works. Besides, it was further to be considered that the water gas coming from the decomposition of the steam by the carbon in the shale coke made, when cooled and freed from the accompanying water, an excellent fuel for heating the retorts. To supplement these gases, it only required from 0·75 to 1 cwt. of coal to carbonize a ton of shale; whereas the shale coke, or refuse, was of no use in gas-works. The shale required from 3 to 4 cwt. of coke from coal to carbonize it; and, instead of being a source of profit in the form of producing coal gas and ammonia, it was in many ways a source of nuisance in gas-works, and was costly to dispose of. The item of carriage was also a serious one. The carriage of shale from the mine to the gas-works might be taken to average 2s. 6d. per ton. Oil in tank-waggons was carried at rates rather lower than shale. It took 10 tons of shale to produce a ton of oil; and therefore, practically, with such shales as were used for oil-making, the carriage of shale to the gas-works would be ten times what it would be for oil. One tank-waggon of oil would convey as much gas-enriching material as ten waggons of shale. He thought what he had said disposed of this point. Reference had been made to the use of oil for enriching purposes, by injecting or spraying it into the retort during the process of carbonizing coal. He did not think this oil could be economically decomposed into gas under such conditions, as it was very liable to be under or over decomposed, dependent upon the rate of injection in relation to the condition of the coal in the retort. Besides, the decomposition must necessarily be effected in the presence of the water vapour coming from the coal, to the injurious effect of which he had already referred; and they all knew the great weight given by their friend Mr. Hislop, of Paisley, to the effect of water in coal-gas retorts during the distilling of coal, in deteriorating the results obtained. Both practical experience and the principles of the decomposition of oil would indicate that mineral oils could be much more economically converted into illuminating gas when they were decomposed by themselves, especially when the resulting gases were to be used for enriching purposes. Probably the next best process would be to decompose the oils in conjunction with water gas; and for some purposes, and in certain positions, it might be a preferable way. Water-oil gas processes might be said to be a compromise between principle and practice; for although not quite consistent in principle, when there existed a small area within which to produce a large volume of gas, and especially when gas-producing plant which could be brought rapidly into operation (as in the case of a fog) was wanted, it might be advantageous to employ a water-gas process. The cost of crude material might also be such as to be equivalent to the defects belonging in principle to that process. He thought these were all the points to which it was necessary for him to refer.

The PRESIDENT thought that they had had a very full discussion on the oil-gas question, and had thoroughly threshed it out. If they could carry it all away with them, he believed each of them would be able to take at least enough to keep him thinking for a good while. He mentioned that Mr. Bell had nothing to add to the discussion.

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Mr. D. M. NELSON (Glasgow) then read the following paper:—

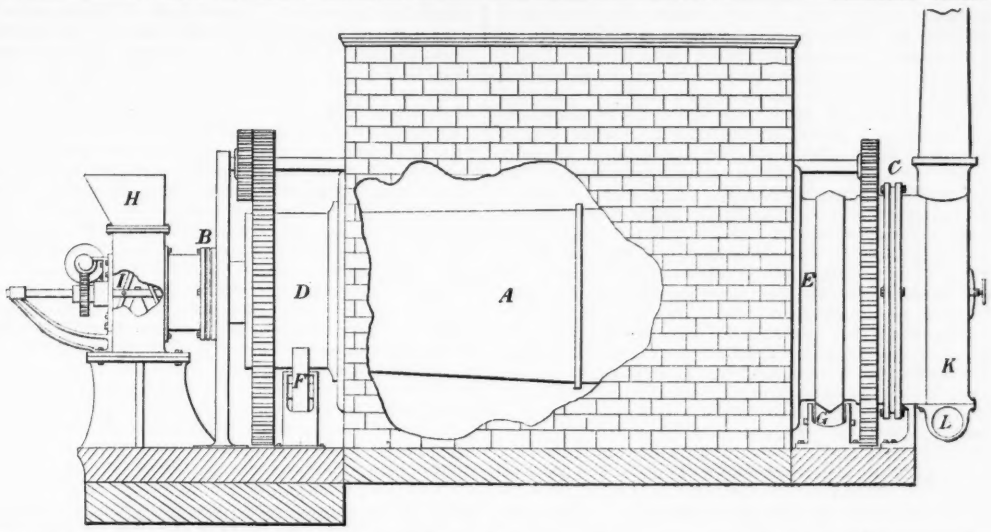
## THE YEADON PROCESS OF GAS MANUFACTURE.

Throughout the entire range of apparatus employed in the manufacture of coal gas for illuminating purposes, there is no part of the process so important as the distillation and carbonizing department; for here it is that the gain or loss of the undertaking is determined. Yet, strange as it may appear, there have been fewer noteworthy improvements effected in the "retorting" of coal than upon any other portion of gas manufacture during the past thirty years. To tackle the mass of coal as ordinarily deposited in, and lying inert on the floor of the retort, lazily stewing into tars and liquors—involving enormous sacrifice of space and time, as well as waste of material—instead of passing off rapidly in a gaseous state, has hitherto defied the art of manual labour; while the skilfully designed machines intended to quicken the operation have been greatly baffled. Any process, therefore, which will effectually enable the external heat applied to the retort to permeate the charge, and so graduated as to accommodate any kind of coal, cannel, or shale, and extract therefrom the maximum quantity of permanent gas of the highest illuminating power these substances are capable of yielding, deserves a ready welcome from gas authorities.

Knowledge, if we may so term it, pertaining to the distillation of coal into gas is very much of the nature of speculative theory, and is difficult of definition; but the waste going on within the retort is none the less real, and fatal to the obtaining of good results. Practically speaking, the gas-retort may be regarded as a sealed book, because of the hidden and complex character of its contents, and of the chemical changes which occur during the period, of from three to six hours, devoted to carbonizing. But in the abstract it is not difficult to infer that its full duty is far from being entirely developed, or that complete efficiency is not attained; for, as a matter of fact, the condition of the bye-products amply testifies that the ordinary systems of distilling into gas are carried on at serious waste and sacrifice of material—involving superlative mechanical power, and human fatigue out of all proportion to the benefits derived.

It is universally admitted that the primary duty of a gas-works manager is to manufacture *gas*, and to produce it *speedily*, saving time and labour; *largely*, yielding a profitable return; and of *good quality*, giving satisfaction to the user—not creating excess of tar, naphtha, and coke, and thereby contributing to the inevitable discomfort of over-production, and the self-inflicted damage and loss resulting from glutted markets. While the gas-retort may be termed the drudge of the household, it is also regarded, and very properly so, as the bread-winner of the family; and it is in this relationship that I desire to arrest your attention for a few minutes, as I describe to you a distinctly novel and the most efficient form of retort for economically and destructively distilling coal, cannel, or shale into gas that has ever been employed on a thoroughly practical scale, capable of being installed in any gas-works, where the annual make exceeds 10 million cubic feet, while for a less quantity, it would of itself be capable of producing more than the maximum required, and, however employed, with an ease and comfort hitherto unknown to the anxious gas manager, free altogether from the slavish drudgery so common with the ordinary gas-ovens.

The Yeadon revolving gas-retort requires very small space—say, about 15 ft. by 10 ft. by 9 ft., or only one-eighth of the room occupied by ordinary carbonizing plant calculated to produce an equal quantity of gas; for instance, from 28 single fire-clay retorts set in four ovens, containing seven retorts each. It will be observed from the drawing that the space usually required for charging and drawing tools and machinery is saved; and when we consider the high—indeed, the too often exorbitant—prices paid for land near towns where gas-works are generally erected, coupled with the saving in the height of walls, and the superficial area of roofing, it will be seen at once that the gain is simply enormous when compared with the expenditure upon such buildings as are required for ordinary retort-benches.




As will be noticed from the drawing, the apparatus consists of a conical-shaped retort A, revolving on two gas-tight glands (one at each end) B and C. The retort proper measures 8 ft. in length and 2 ft. 6 in. in diameter at the narrow end or back D, and 3 ft. 6 in. in diameter at the front end E. It revolves on four friction rollers F and G—two at the back and two at the front. The rollers marked F are square on the edge—giving freedom; while the rollers marked G are V-shaped, so as to keep that end of the retort in place, and assist the gas-tight gland C. By an arrangement at the back end in gland B, the retort may expand longitudinally, which it does, but without interfering with the efficiency of that gland. At the inlet of the back end there is a hopper H, fitted with an archimedian screw (or knife-blades) I which conveys the coal into the retort. The interior of the retort is fitted with six taper blades or wings, which run parallel with the retort, and serve the purpose of breaking up and mixing the charge—an essential part of the process.

While revolving, the conical shape of the retort causes the charge to be gradually worked along to the front, or discharging end K (and it occupies only about twelve minutes in doing so), where the resulting coke or ash is passed through the exit-pipe L, into which is fitted an archimedian screw, similar to that at I, and thus delivers it into trucks, or sends it out directly to the coke-yard. At the back end of this pipe there is a jet of water, which constantly drenches the coke, and also prevents any escape of gas. Of course, there are the usual ascension-pipe and hydraulic main, which latter it is proposed to dispense with. The retort itself is made of iron, as are also the glands and all other parts; and the force required to cause it to revolve is 1-horse power nominal. This retort is capable of carbonizing from 12 to 15 tons of coal per 24 hours.

To save complication of figures, I have here a simple table showing the make and sperm value; the figures being the average of 24 separate tests, on a practical working scale. In these experiments we used one ton of unscreened coal, and had 15,855 cubic feet of 22-candle power gas; showing an increase of 5551 cubic feet, and 5-candle power, over that obtained by the ordinary process with screened coal.

| *Ordinary Process.* | | *Yeadon Process.* | |
|---|---|---|---|
| Coal yields | 10,700 c. ft. | Coal yields | 15,855 c. ft. |
| Sperm | 408 grains. | Sperm | 530·88 grains. |
| Sperm per ton | 623·65 lbs. | Sperm per ton | 1203·44 lbs. |
| Illuminating power | 17 candles. | Illuminating power | 22 candles. |

From these figures, any gas manager may easily calculate the gain such a retort would be to him in his working, even as an auxiliary. From *shale* the increase is immensely greater and more profitable. That subject will form interesting matter for another paper.

The resulting coke is of no worth as fuel, being incombustible; but is of equal money value, as it can be utilized for fire-proofing, and making a first-rate non-conducting cement, also for fine surface asphalting. The tar takes the form of a crude pitch; but while in the hydraulic main it has the consistency of a heavy tar, only assuming the form of pitch when exposed to the air. In the liquor-well will be found a small quantity of tar of a very light, watery nature, with practically all the hydrocarbons extracted. As to the ammoniacal liquor, it is only about half the usual strength, caused doubtless by being deprived of a large quantity of its illuminating gas before reaching the tar-well.

The gas made by this process is thoroughly permanent, as was proved last February, when we put 50,000 cubic feet of it into a holder, where it remained undisturbed for three weeks. On being tested at the end of that period, it was found to have lost only a quarter of a candle, and 20 cubic feet of its bulk—a loss so trifling as to be easily accounted for at that season of the year. Whatever is lost in tar, coke, and liquor, therefore, is more than compensated for by the increased quantity and quality of the gas, not to mention saving in labour.

As I have no desire to exhaust the subject, or to weary you by a lengthened reading (preferring rather to suggest inquiry such as may lead to discussion), I conclude by summarizing as follows: Being able to produce gas in 12 to 13 minutes is of infinite value during periods of fog and dull weather, and on the occurrence of mishaps or repairs, especially so when the demand for gaslight is sharp and excessive. The value of such an apparatus, capable of carbonizing any quality and kind of coal during a period of scarcity and difficulty in obtaining the ordinary supplies, will be manifest. By this process, the system of enriching poor gas by oil, &c., is rendered unnecessary; almost any coal being made to yield the desired illuminating power. There is no trouble from the deposit of carbon in the retort, or from choked ascension-pipes, the worry of gas managers. The enormous saving and convenience, in being able to heat up the retort in 4 instead of in 48 hours, as required by ordinary retort-ovens, is obvious. Sunday ordinary labour and night work are reduced by about 75 per cent.; while it will abolish overwork, and payment for overtime, also casual and foreign labour. All the foregoing advantages, and many others too numerous to detail here, are palpable gains, and cannot be overvalued, either financially or socially, in the economy and utility of manufacturing gas.

*Discussion.*

The PRESIDENT intimated that Mr. David Terrace was an authority on the subject dealt with in the paper.

Mr. NELSON said his reason for not introducing Mr. Terrace's name was that experiments carried out by that gentleman and others were entirely independent of the process, and were made for the benefit of the gas industry; all the parties interested being banished from the premises.

Mr. D. TERRACE (Middlesbrough) remarked that, besides Mr. Nelson, he was the only one present who was acquainted with the process; and anything he had to say about it he had embodied in a paper which he read before the North of England Gas Managers' Association in April last.* But he was not able to get such results as Mr. Nelson had portrayed. The coal they used was Thrislington; and they obtained from it about 12,000 cubic feet of 18-candle gas, which was 2 candles more than they had in the ordinary way, and did not show any great enhancing value in the Yeadon process. Of course, he could recapitulate his own paper—in fact, Mr. Nelson only recapitulated it—in respect to the points of advantage in the Yeadon over the ordinary process. But until it was really practically at work, which the plant from which the results now before them were obtained was not (because Mr. Nelson referred to its exposure to the weather), it was impossible to say what it could do. There were certain things which had to be found out. This was quite a new apparatus, and would require to be thoroughly tested. He was going to mention the subject of coal analysis, in which it was very wisely said that the conditions of the tests ought to be stated. If they could bring their results up to this, it would need very careful working. He had recently had a circular handed to him which said: "Believed to be correct, but not guaranteed." He took this to be owing to the favourable action of the Association on past analyses. It was rather strange that they should have the two processes in juxtaposition—the Peebles process and the Yeadon process. It was very evident there was something in the coal which they wanted to get out, and which they did not just now; and he trusted the two subjects they had had before them would spur them in the direction of enhancing the products of the coal in the ingredients they dealt in.

Mr. JOHN WEST (Manchester) said he had carried out some

* See JOURNAL, Vol. LXI., p. 775.

experiments on the subject before the meeting. About 25 years ago, he thought, he made some trials with a little machine into which he dropped coal from a hopper. He had an ordinary clay retort, closed at either end. In that retort he spread the coal in an even layer on the bottom; and he certainly obtained some very large volumes of gas—from 12,000 to 13,000 cubic feet per ton of Newcastle coal. He had, as a product, a thin layer of a very light coke. He was certainly enraptured with the results; but, after an extended experience, he found that the fuel required was rather exorbitant. This was a question he would like to put to Mr. Nelson—as to the amount of fuel used per ton of coal carbonized by the Yeadon process. He found that he lost a great deal by the radiated heat; there being a large exposure of ironwork at either end of the retort. Of course, it was a very different system from the one before them; although it appeared to him there would be a little similarity. His retort was stationary. The volume of gas he obtained was very good, and of a permanent character. A number of his friends in the South saw it working; but after it had run for some time, he did not proceed with it, because he could not make it quite satisfy his friends in the matter of pounds, shillings, and pence. He spent a considerable amount of money on the process, and gained much information, which he stored up and applied in another direction He thought the Yeadon process was worthy of their consideration and trial. He believed in trying all these things, and ascertaining what they could get out of them. It was good for all of them, if they were to arrive at a right conclusion. He had not seen the Yeadon apparatus; and therefore he could not form an opinion as to its mechanical and economical efficiency. The temperature to which it was subjected would severely test it; but he thought they might take it that this retort had entered into the "region of practical politics," and that, as time went on, they might hear whether it had turned out good, bad, or indifferent.

Mr. J. Ballantyne (Rothesay) said he noticed that Mr. Nelson had not given them any information as to the cost of the process. If they were to get no better results than Mr. Terrace had obtained (and if there was no coke, how were they to heat the retort?), this would make the process very expensive. Perhaps Mr. Nelson could give them some information on this point.

Mr. J. B. Terrace (Brechin) remarked that one thought had occurred to him while listening to the paper before them, and that was why Mr. Nelson, who was a Scotchman, and lived among Scotch cannel, did not use some of their high-class cannel coal in his retort. If he obtained such high results from a mixed or small coal, which ordinarily yielded 17-candle gas, and 22-candle gas with his Yeadon apparatus, they might get 60 or 80 candle power out of the first-class cannel they employed. With regard to the mechanism of the machine, he thought it was a very ingenious one. He saw that water always had to be poured upon it, to keep it cool. He thought, looking at it, that it was worth a fair trial. He did not like to condemn anything before giving it a thorough trial; and not only one, but many trials.

The President said he did not know that he could add anything to the discussion further than the remarks he had made in his address; but he thought no one, looking at the drawing and the results, could question for a moment that there was really something in the Yeadon retort. A revolving retort was not a new thing, though it certainly was new as far as gas making was concerned. Revolving retorts, however, were used in other processes; and a retort which he had himself seen working in some of the Cornish mines, for roasting tin and copper ores, was not unlike the one before them. The calciner there was set on a level plane, and the fire travelled through the tube. Of course, in making gas, they must keep the flame outside the retort. This had been accomplished; and by tapering the retort, they secured the motion or travel of the material. He thought the secret of the Yeadon retort was that the coal was treated in the same way as the oil in Mr. Young's process. Mr. Young had been successful in cracking the oil in very small particles; and the patentee of the Yeadon retort had succeeded, in a manner, in cracking up the coal in the same way, in very small particles. He should like to ask Mr. Nelson if he experienced any difficulty in keeping up the proper heat of the retort—in keeping it continuously working (say) for a week at a time; and also whether there was any difficulty in getting the coke to come out. There was one good feature of the retort, and that was that there were no moving parts inside it. Various methods had been tried; but, as far as he could see, it was impossible to get any material that would stand the temperature at which they had to carbonize coal—from 1800° to 2000° Fahr. The great advantage of the retort was, he thought, its capability of treating dross and small shale. There were enormous piles of this, as they saw when travelling over the country. In times of strikes, it might be a question whether the Yeadon retort could not be profitably employed in working up these vast heaps of refuse. He would like to ask Mr. Nelson one other question. He could easily suppose that, by cracking up the coal in the Yeadon retort, it would be quite possible to get 15,000 cubic feet of gas from a ton; but he could not understand the last line of the table. He could easily see how an extra quantity of gas could be obtained; but the additional candle power seemed to be difficult to accept. He was sure Mr. Nelson could explain this; but he had overlooked it.

Mr. Nelson, in replying, expressed his obligations to the various speakers for their criticisms of his paper. He said his friend Mr. Terrace had stated that he had tried in the retort a coal that was recognized in Yorkshire to be the toughest and most disagreeable for gas managers to work. They adopted the plan of using a coal that was largely employed in gas-works in Yorkshire farther south than Middlesbrough. They used Aldwarke Main coal. This was a very much higher type of coal than the Thrislington which Mr. Terrace dealt with. He mentioned this to explain why Mr. Terrace did not get anything like parallel results. They found that the better the quality of the coal they worked with, the higher were the results they obtained. For instance, they had used shale; and they had an immensely increased result. They then tried cannel; and they also had an increase that was quite enormous. He might likewise state that they sent up from one of the shale heaps in Scotland a waggon-load of shale, which yielded 6000 cubic feet of 24-candle gas. At the present time these heaps of shale were an absolute waste, cumbering the ground; and the officials of one of the oil companies in Scotland had said they would be very glad if they could have theirs removed. It was necessary they should understand that there was no discrepancy between the remarks of Mr. Terrace and his own; for the simple reason that coal of a different character had been experimented with. On this account, he might say that the illuminating power they obtained from working the coal was derived from the large proportion of naphthas, benzols, and other properties of the coal they turned into gas. No naphthas or light oils were found in the tar-well. There was nothing but ammoniacal liquor. With reference to Mr. West's remarks, he might say that the heat was so low at the port, that they could put their hand upon it; and the heat bearing upon the retorts was only applied to about 5 feet of it. It differed from an oil or any other retort in the fact that it did not buckle or blister. Because of its revolving, there was no unequal draw upon it; and the heat was equal. The retort, which had been in use for two years and a half, was as smooth on the surface now as on the day it was put in. With reference to Mr. Ballantyne's remark as to the want of fuel, such as coke, they had an arrangement by which they heated the retort by its own gas, on the Bunsen principle. They found that the gaseous fuel was better than Leeds coke. The expense would be greater, in the exposed position in which the retort was, than if they had fitted it in a confined space. He might say, however, with regard to the question of cost, that he made a calculation, which showed that something like 50,000 cubic feet of gas could be put into the holder at 6½d. per 1000 cubic feet. Assuming that they did this, instead of having four ovens of seven retorts, each producing gas, they could make a calculation of the one as against the other. With reference to the price paid for the apparatus, it was rather less—£700, perhaps, as against £800 for retort building and other apparatus, and the structural portions required for the retort-house. All the difference between this apparatus and the experiments which had gone before was that in the Yeadon process there was no heat to warp the fittings. There was no difficulty whatever in keeping up the heat. In point of fact, they found that it was less variable by the Yeadon process than it was in ordinary retorts; and as to the ejection of the coke, he might tell them that it came out just like sand—there was no congestion and no difficulty was experienced in its falling out. With reference to the bearings, he might say that the water spoken of had nothing to do with the bearings. It was not used to keep them cool, it was to quench the coke and it helped to seal the gas and prevent it escaping.

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Mr. J. Ballantyne (Rothesay) next read the following paper:—

## COOKING BY GAS.

Cooking by gas is a subject which has not received at our meetings that attention which it deserves. So far as I have been able to find, it is exactly ten years—in 1883—since a paper (and it seems to be the only one which has been written on the subject) was read at the Stirling meeting, by Mr. J. M'Crae, the respected Engineer of the works belonging to the city in which we are now met. He again touched on it in 1885, in his presidential address of that year to the Association. Since that time, no reference seems to have been made to it at any of our meetings—certainly not at any of those at which I have had the pleasure of being present. It is therefore owing to this silence on the subject that I have been induced to take up the matter, so as to again bring it under your notice, and also record the success which has attended its introduction into Scotland during the last ten or twelve years—a success which, I am sure, is as great as Mr. M'Crae ever anticipated when he wrote his paper in 1883.

Dundee, I believe, has also the honour of being the first place in Scotland to adopt the system of hiring out cookers and other similar appliances to the gas consumers. This was, I think, in the year 1881; and it is no doubt owing to the example then shown that we owe the success of that system. Previous to its introduction into Dundee, it had been adopted in a large number of English towns; yet we Scotsmen, owing no doubt to our proverbial "canniness," were slow to take advantage of the experience of our brethren across the Border, until Dundee led the way. Of course, we of the smaller works naturally expect our larger neighbours to lead the van in new enterprises and experiments, as a few hundred pounds spent in this way is a small matter to an important undertaking, whereas it would be

a very serious thing to a small one were the experiment to turn out unsuccessful. But we are always glad to follow the example set us, especially when we think it a good one; and hiring out gas cookers was certainly a step in the right direction. Had it not been for this new outlet for our gas, I am afraid many of our works would not be in that healthy and flourishing condition in which we now find them. I therefore desire to call your attention shortly to the advantages of encouraging, in every possible way, the system of cooking by gas. Much of what I have to say will not be new to many of those who have already adopted the system of hiring out gas cookers; but I trust it may be of some interest and use to those who have not as yet done anything in the way of hiring them out. There are still many places where I am sure the system would be a success if adopted.

The gas cookers of to-day are possibly as near perfection as they can be; at least, so far as the heat to be obtained from the gas consumed is concerned. There may yet be slight alterations in the details of their construction; but it is questionable if much more can be added to their efficiency. As the heaters of the future have yet to be made, I do not intend to make any reference to them, but will confine my remarks solely to cooking by gas.

Every gas manager has here a large field which he can work, if so disposed, and a field which, I am persuaded, if properly wrought, will be found to be one of the best paying he can possibly get. In the first place, it does not require any extra plant to work it, as the consumption is principally during the day. To meet an increased night consumption means with most of us an addition to our plant, as very few works can boast of ample provision in this respect. On the other hand, no extra plant will be required with an augmented day consumption until it exceeds that of the night—a not very probable thing for many years to come. Again, the employment of gas for cooking purposes is principally during the summer months, when the largest proportion of our plant is lying idle, although it will be found that, when once consumers begin to use cookers, they will do so, more or less, all the year through, but not to the same extent during winter as in summer, when the weather is hot. In Rothesay we have many consumers who use nothing but gas for cooking all the year round, as they find it cheaper than coal for the purpose, and, of course, very much cleaner. During the months of May and June, and part of July, our day consumption is as great now as that of the night. This means an increase in the daily make, during that period, of almost 100 per cent.

We began to hire out gas cookers in 1886; and since then our annual make of gas has increased from 22,127,700 cubic feet in that year to 32,741,400 cubic feet in 1892—being an advance of 48 per cent. For the six years prior to 1886, the increase was only about 9¼ per cent., as the annual make of gas in 1880 was 20,249,600 cubic feet. Or if we take the revenue from consumers by meter alone, we find that for the year 1886 it amounted to £3392, with the price of gas at 4s. 7d. per 1000 feet, less 10 per cent. discount, if paid within twenty-one days; whereas in 1892, with the gas charged at 3s. 9d. per 1000 feet, less 5 and 10 per cent. discounts if paid within a month, the amount was £4235, or an increase of £843, notwithstanding the reduction in price. Fully 11 per cent. of our consumers are now supplied on hire with cookers or ranges, hot-plates, and oven fittings; and, we calculate that, on an average, each cooker or hot-plate is equal to at least £5 per annum of revenue for gas consumed. For cookers we charge 10 per cent. on the list price; and for hot-plates and oven fittings, 6s. per annum—all fitted up free. I am safe in saying that, were it not for the hiring out of gas cookers, the increase during the last six years would not have exceeded 7 or 8, instead of 48 per cent., and probably less; as for two years preceding the introduction of cookers into Rothesay there was actually a decrease in the quantity of gas produced. And when we take into account the enormous advance which has been made in the construction of oil-lamps, as well as the great extension of lighting by oil, especially among the better classes, we could hardly expect that the same rate of increase could have been kept up during those six years, as compared with the previous six. We have also to take into account that all public-houses have been closing an hour sooner than usual; and should the earlier closing of shops become general, there will be a still further reduction in the quantity of gas required for lighting purposes. It thus behoves us to find as many new outlets for our gas as possible, so that our progress may be ever onward. It is a bad sign when the make of gas shows a steady drop year after year, as it means, with a declining revenue, less profits.

But it may be asked, is it a safe investment to engage in the hiring out of gas cookers? Will it not be the case that, after a few years, we shall have them all thrown on our hands as old iron, and that the cooks and housewives will go back to their good old-fashioned coal fires? I firmly believe that so long as gas is to be had by which to cook, there will be a demand for gas cookers. The form of the cooker may change somewhat, and that can be very little now; but there is no fear of cooking by gas becoming obsolete till that far-off day which has been pictured for us by some of our friends (?) when there will not be a bit of coal left the wide world over by which either to make gas or kindle a fire. Cooking by coal fires is much more likely to be a thing of the past than cooking by gas. In truth, with many it is a thing of the past already. And is it not a fact, patent to everyone, that gas-stoves are becoming more popular every day? There need, therefore, be no fear of getting them back as old iron, till they have been completely worn out in good service. In my own case, I have not a single gas cooker that is not in use, and earning its 10 per cent.; and, further, I have not a single obsolete cooker belonging to the Corporation. True, a few of the older forms have been made more modern, by having newer designs of burners fixed in them; but these do not exceed a dozen cookers in all. Any handy man can easily put in new burners at very little expense.

As to repairs, I do not know what has been the experience of others, but I have found it to be a very small item indeed. With the exception of those cookers, already referred to, which received new burners (and, strictly speaking, this was not a repair, but an alteration), and a few odd frets for the grills, we have had very little expense for repairs during the six years we have hired out cookers. The cleaning of cookers, after receiving them back from customers, is the most expensive item we have had in connection with them as yet. Apart from this, our outlay for repairs will not much exceed 1 per cent. Most of the cookers returned are sent in to us in the autumn and winter months, and we clean them at odd times when we have not much else for our men to do; and this keeps them working when they might otherwise be idle or doing very little.

If a corporation or a company wish to make cooking by gas a success, they must fix the cookers, free of charge. Man's faith, after all, is very weak; and few of our consumers have enough, at first, to enter into any expense in regard to a thing of which they may know little or nothing. At any rate, their faith in cooking by gas may not be sufficiently strong to enable them to lay out probably from 20s. to 40s. for fixing up a cooker. Our general system of renting houses by the year is also against them doing it at their own expense. A tenant never knows how long or how short a time he may occupy a house; and as he may have to leave it at the year's end, this is a great drawback to him hiring a gas cooker, and paying for fixing it up. But if the corporation or the company fix the cookers free of charge, he will probably be only too glad to take advantage of the arrangement, and hire a cooker. Again, should a tenant fix up a cooker at his own cost, when he wished to leave the house, he might have to sacrifice all the expense to which he had been put, as it might not be convenient for him to have the cooker in the place to which he would afterwards remove. On the other hand, with a corporation or a company fixing up the cookers at their expense, the cooker and all the tubing and fittings can be taken away when a tenant removes, with the loss of only a union coupling, costing from 3d. to 4d., and the fitter's time. For this reason, no tubing but that of block tin should be employed, unless you are certain the tenant will occupy the house and keep your cooker for a great length of time, in which case composition tubing may be put in. As, however, we are sure of nothing in this world, and know not what a day or an hour may bring forth, you should use block tin, which can be removed and utilized again time after time. Even when it is no longer fit for use, it can be melted down and sold, when it will bring nearly as much as was at first paid for it. Besides, after all, there is very little difference in price between block tin and composition, when we take into account the weight of each. We have, as a rule, always used block tin at Rothesay; and it has been our experience that, in the end, it is very much the cheaper material of the two.

Further (and my remarks now refer more especially to smaller works), all who can afford to keep a fitter, should try and employ one who can do the fitting necessary in putting in gas cookers; so that you may be able to undertake the fixing of them yourselves. When this is done, the expense is very much reduced. Our average price for fixing them ourselves does not exceed 12s. 6d. each, including the flue. That is allowing for—

| | s. | d. |
|---|---|---|
| Block tin tubing, 30 feet (say) | 7 | 6 |
| Flue for oven of cookers | 1 | 6 |
| Coupling and hooks | 0 | 6 |
| Time—Fitter, 5 hours, 2s. 6d.; labourer, 1½ hours, 6d. | 3 | 0 |
| | 12 | 6 |

We find in our case 30 feet to be about the average length of tubing employed; but this will greatly depend upon where the meters are situated, as in most cases it is necessary to lead the pipe from the meter. If they are at the front door, with the kitchen at the back of the house, or in some equally out-of-the-way place, where meters are generally put, the expense may be a little greater; but, taking it all through, it should not much exceed what I have stated. It is therefore not a great sum, when we consider that the piping can all be taken away again, as already indicated, with only the loss of time and a coupling.

In towns where gas-fitters have shown some energy in introducing and pushing the sale of gas cookers, it would be unfair to take the fitting from them. But, unfortunately, such cases are not many; and an arrangement could be made to divide the work among them, or even to give it altogether to the man who had been pushing the trade. As a rule, gas-fitters have left the gas-stove business "severely alone;" and in their case there can be no hardship in a corporation or a company fixing the stoves themselves. If a corporation or a company are entitled to hire out cookers, they are equally entitled to fit them up at the least expense. At Rothesay we

leave the sale and fixing of gas-heaters entirely to the gas-fitters, as well as all grillers, Bunsen burners, &c.

Gas cookers should be as simple as possible in construction and working; and I would recommend those made of enamel sheets, both inside and outside; as they are very much lighter and more easily handled, and can now be had at the same price as those made of cast iron. They also look better, and are kept clean with less trouble. It comes to be a serious question, especially in small works, when three or four men may be required to carry a heavy cast-iron cooker up a flight of stairs in a tenement house; whereas, in the case of those of lighter make, the fitter and his assistant should be quite sufficient for the work. Those made of enamel sheets will last as long as there is any need for them; and by the time they are used up, they will have repaid themselves, by hire alone, a good many times over. A corporation or a company will be quite justified, therefore, when the stoves are worn out, in replacing them by new ones. We do not require an article that will last for ever, but one that will last a reasonable time, and possess all the advantages possible.

We also find that, on an average, from 5 to 7 per cent. of our cookers are returned to us, and in most cases through the consumers either leaving town or removing to a different house where it is not required. In a very few cases, through the extravagance and carelessness of servants, resulting in large bills, we have had cookers returned to us by consumers, on account of being too expensive; but we have also found that, after a short time, they have invariably come back, asking for another one, as the ordinary fire was found too hard to work after their experience of gas. To encourage our consumers to keep their cookers after once getting them, and not to ask for them to be exchanged for other sizes or makes, it is a question if we should not have some graduated scale of charges, instead of the 10 per cent. I should be inclined to charge 10 per cent. for the first three years only that a consumer has had a cooker without any change, 7½ per cent. for the following two or three years, and (say) 5 per cent. afterwards. Or, if this should be thought too complicated, charge 10 per cent. for the first five years, and 5 per cent. afterwards. This would, no doubt, considerably reduce our returns for hire of cookers; but the longer we can get our consumers to keep their stoves without changing them, the better for us. To remove a cooker from a house, and fix that of another maker, because Mrs. So-and-So next door has it, is a thing we should try to discourage as much as possible. Time is occupied in sending out another cooker, and taking away the one in use; and when a stove has been brought away, it requires cleaning before it can be again employed, all of which means a considerable amount in wages. I therefore think it would be an advantage for us to forego a little of the rental, and induce the consumers to keep the stoves after once getting them. This does not apply so much to towns where only one make of cooker is in use; but there are not many of us who hire out cookers who are so fortunate as to be in this position.

It is a great advantage to have in use cookers of as few makers as possible. Those who are just beginning to let them on hire should study this, and fix on the best make in the market, and keep to it, and not allow any other form to be hired out. It will save a great deal of trouble afterwards. We have no fewer than five different makers' cookers in use at Rothesay; and we have found this to be a disadvantage in the way referred to. Those who are placed in this position would, I believe, find that the reduction on the rental would, as already mentioned, be an inducement to consumers to keep their cookers. And, further, where only one make of cooker is hired out, as there is always some change taking place in the construction of these appliances, the consumer would think twice, where the graduated scale of charges is in operation, before parting with his cooker for any supposed improvements which might be in the newer forms. An extra column in the stove ledger, containing the date when the cooker was fixed, is all that would be necessary to prevent confusion in the charges. That is the objection which has been raised to it in our own case, or I believe it would have been adopted by this time; but I yet expect to see it introduced, and before very long. If we recovered our expenses from the hire of the cookers—and the graduated scale indicated would enable us to do this, and leave a margin besides—it is about all we should look for; and we should trust to the extra sale of gas for our profits or their equivalent. This is really where the advantage of the system rests—not in the rental returns, but in the extra consumption of gas.

And now a word in closing with regard to differential rates for gas consumed for other than lighting purposes. We do not charge differential rates for gas consumed for either cooking or heating; but we allow discounts of 5 and 10 per cent. on all accounts, if paid within a month after the date of rendering. This, of course, comes to much the same thing as a differential rate, in so far as it concerns consumers who are not able to pay within the prescribed time. It has been urged against differential rates that they are unfair, and place the night consumer at a disadvantage as compared with the day one. In other words, the man who can afford to pay for a gas cooker gets his gas for culinary purposes cheaper than his poorer brother, who can only afford to burn it at night for lighting his house. But the same objection holds good with regard to discounts for payment within a given time, as it also places at a disadvantage the poor man, who has not the money at hand with which to pay his bill within the specified period. These objections, however, may be more imaginary than real, as the poor man must remember that, if he does not pay within the allotted time, he generally causes more expense to the corporation or the company in collecting his account. The day consumer does not necessitate any extra outlay for holders, mains, or even service-pipes, but, on the contrary, is utilizing plant while it would otherwise be lying idle; and for this reason he is entitled to some consideration. The night consumer will also reap the advantage of cheaper gas, although he does not get it at the same rate as the day consumer; for the larger the make of gas is, the greater will be the profits, and consequently the gas will be sold more cheaply on that account. The principal objection to a differential rate is that it requires an additional meter, so as to arrive at the correct quantity used. This means an extra outlay of capital. But in towns where a charge for the use of the meter is made, it will not matter so much, if the consumer is willing to pay it. In all cases, as far as practicable, the differential rate meter should be subsidiary to the primary one; and it may be placed alongside of it. No extra service from the main, however, should be put in, unless it happens to be cheaper or easier to do it in that way than to take the supply from the outlet of the meter already in use. It would be a great mistake to riddle our mains with holes for gas-cooker services or any other appliances which might only be in use for a short time. It would also help to increase the leakage area—a thing very much to be avoided. At Rothesay we prefer the discount system, as it is easier and cheaper to work. Graduated discounts on (say) £5 a year and upwards could be allowed. This will save the further outlay of capital for meters; it will relieve the consumers from paying an additional rental for the meters, in towns where these charges are made; and it will obviate a great deal of extra book-keeping, which is necessary where differential rates are in use. The discount system also helps to make consumers pay their bills more promptly. But at the same time I see no objection to differential rates, where they are preferred. The discount would affect everyone whose account reached a certain sum. The differential rate would only apply to those who used gas for a given purpose, whether the sum were large or small. In this way a person using probably only 20s. worth of gas would get it at a cheaper rate than the consumer who might burn £50 worth; so that another hardship comes in there. But these apparent difficulties should not be allowed to stand in the way of making gas more useful and popular. It is only by finding new outlets for our gas that we can hope to hold our own against the competitors now in the field. One thing is certain, that, should the electric light become the light of the future (as it no doubt will, to a certain extent, in the course of time), those towns which have been fostering cooking and heating by gas will come out of the struggle with least loss. In our own case, suppose we lost the whole 20 million cubic feet of gas now required for lighting purposes, we should still require to manufacture at least 12 millions for our gas-stoves. This, then, is the weapon with which to fight the electric light. If this branch of our business were pushed as it might be, we need have no fear of seeing the electric light introduced, because all that would be more than regained by the gas required for cooking and heating purposes.

I have tried—very imperfectly, I know—to place before you the advantages of encouraging the use of gas for cooking; and as it has done more than anything else, during recent years, to increase the consumption of gas in those places where it has been so used, I trust the various points noticed, as well as others not referred to, will now be freely discussed. With even such a simple matter as cooking by gas, and hiring out appliances for the purpose, we require all the information it is possible to obtain; and we know that "in the multitude of counsellors there is safety."

Owing to want of time, discussion on the paper was postponed till the next meeting.

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**Electric Lighting Provisional Orders and Licences.**—The Board of Trade have issued their report on their proceedings during the past year under the Electric Lighting Acts, 1882 to 1890. It is stated therein that eighteen applications for Provisional Orders were received in time for consideration during the present session; eleven of them being made by local authorities, and seven by companies. Six of the applications related to the County of London; and four were granted—viz., to the Vestries of Hackney, Hammersmith, Islington, and Poplar. Orders were granted for the following towns: Altrincham, Barnet, Beckenham, Bridgend, Colchester, Eccles, Newcastle-upon-Tyne, Newmarket, Partick, Reading, and Taunton. The transfer of municipal Orders to companies was sanctioned at Cambridge and Hove. Bills to confirm these Orders were duly introduced into the House of Commons. Including the Orders mentioned above, there are 170 in force, of which 112 belong to local authorities. Licences were applied for in the case of the Crystal Palace District Electric Supply Company, Limited; the Pontypool Electric Light and Power Company, Limited; and the Corporation of Taunton. They were granted in the two latter cases; but the Licence for the Crystal Palace District was under consideration at the date of the report.

## NORTH OF IRELAND ASSOCIATION OF GAS MANAGERS.

### Annual Meeting at Coleraine.

The Annual Meeting of the above Association was held last Tuesday, in the Hall of the Café, Coleraine. Mr. W. S. Stormonth, Engineer and Manager of the Coleraine Gas-Works, the President, occupied the chair.

The President, in opening the proceedings, extended to all the members a hearty welcome to Coleraine, and assured them that he would do whatever lay within his power to make their meeting a success.

### A Welcome to the Association.

The Hon. Sec. and Treasurer (Mr. J. Whimster, of Armagh) read the following letter from Mr. R. A. Taylor, Chairman of the Coleraine Town Commissioners:—

I regret that previous arrangements deprive me of the pleasure of meeting with your Association on the occasion of their visit to Coleraine; and that personally I have not the pleasure, as the Chairman of the Town Commissioners, of bidding you welcome.

I look upon such meetings as of great importance, giving to the several managers of gas-works throughout the country the advantage of what is most valuable—the exchange of views, the throwing out of suggestions, and noting improvements.

The Coleraine Town Commissioners, being the owners of the gas-works here, naturally take a direct interest in the gas question; and you will observe, on visiting our works, that they are in most excellent order. Our make of gas has been increasing by about 10 per cent. annually; and although a considerable outlay has been recently made, through the skilful management of your excellent President, Mr. Stormonth, our Gas-Works Manager, we have been enabled to reduce the price of gas to the consumers by 5d. per 1000 cubic feet this year—bringing it to 3s. 9d., which I think is perhaps the lowest price at which gas is supplied in any town of the same size in this country.

I hope your Association will enjoy their visit to Coleraine and neighbourhood, and carry away with them good impressions of the town and its inhabitants.

### Annual Report.

The Secretary next submitted the annual report of the Committee, as follows:—

The Committee have pleasure in announcing such an attractive programme for the Coleraine meeting. The Vice-President's paper and Mr. Macadam's lecture both bear upon the manufacture of gas from oil, which may be said to be the burning question of the day amongst gas engineers; and the paper by Mr. Main, deals with a subject which has a most important bearing on the future prospects of all gas companies. At the same time, the Committee cannot but express their regret that our ordinary members should seem so backward in contributing papers for our annual meetings. Whilst aware that most of our members represent small gas-works, they think that this fact should encourage, rather than deter them from contributing the results of their experience in the various departments of their work; as, though a record of their successes or failures may seem commonplace to themselves, yet it would doubtless be exceedingly useful and instructive to their fellow-members.

The resolutions recently adopted by the South-West of England District Association, with reference to a scheme for the federation of the District Associations, were communicated to your Committee; and they resolved to bring them before this annual meeting, and recommend the appointment of representatives to the conference on the subject shortly to be held in London.

The Committee have taken a new departure this year, in organizing an excursion for the day following the business meeting, in the hope that the gathering may partake more of a social nature; and they trust that their action will be endorsed in a large attendance of the members and their lady friends—especially as the locality to be visited is so noted and interesting as the Giant's Causeway.

Your Committee debated the question of altering the date of the annual meeting, which was remitted to them for consideration; but they could not see their way to recommend any other date as more suitable than the one originally adopted.

According to Rules 25 and 26, three Members of Committee retire now, and are ineligible for immediate re-election. The retiring members are Messrs. Salmon, Todhunter, and Walker.

(Signed) W. S. Stormonth, President.
James Whimster, Secretary.

Accompanying the report was the financial statement, which was also read by Mr. Whimster.

On the motion of Mr. E. Stears (Lisburn), seconded by Mr. R. Ross (Dungannon), the report and statement of accounts were unanimously adopted.

### The Proposed Federation of Gas Associations.

A letter was next read from the Secretary of the South-West of England District Association of Gas Managers (Mr. Norton H. Humphrys, of Salisbury), submitting the two resolutions on the above subject passed at the meeting of that Association on the 11th of April, and requesting that the matter might be brought before the North of Ireland Association.

Mr. T. Frizelle (Holywood) agreed with the decision which had been arrived at by the Committee, and moved that the matter be allowed to remain in their hands.

Mr. G. Cummings (Ballymoney) seconded the motion, which was agreed to.

### Admission of New Members.

On the motion of the Secretary, seconded by Mr. A. Mackenzie (Edinburgh), the following new members were elected: Mr. T. Llewellyn (Newbridge, Co. Kildare), Mr. R. Gault (Aughnacloy), and Mr. T. M. Walsh (Kilrush).

On the motion of Mr. Frizelle, seconded by Mr. Ross, Mr. J. R. Noble (Belfast) was elected an extraordinary member.

### Election of Office-Bearers.

The Secretary intimated that the Committee wished to propose Mr. C. B. Outon, of Inchicore, Dublin, as President for the ensuing year.

This was agreed to *nem. con.*

Mr. Outon said he desired to thank the members for the honour they had conferred upon him; and he expressed the hope that in the coming year the Association would be most successful. So far as he personally was concerned, he would do his utmost to further the interests they all had in view.

The Secretary then stated that the Committee considered that they could not do better than submit to the meeting the name of Mr. P. J. Salmon, of Galway, for Vice-President.

This was adopted unanimously.

The meeting next elected, as successors to the three members of Committee who were retiring, Mr. T. Hands (Enniskillen), Mr. G. R. Love (Dundalk), and Mr. C. B. Tully (Sligo).

On the motion of the President, seconded by Mr. Ross, Mr. Whimster was again elected Hon. Secretary and Treasurer.

### Place of Meeting for 1894.

The President intimated that the next item on the *agenda* was the selection of the place of meeting for next year.

The Secretary remarked that this matter had also been considered. Their newly-elected President resided in Dublin; but the Association met in that city last year, and Armagh had therefore been agreed upon. He would be personally delighted for the Association to meet there next year. The situation was central, and would be more accessible than other places they could mention. In this connection, he added that the claims of Portadown had also been taken into consideration.

Mr. Outon moved that Armagh be the place of next meeting.

Mr. Mackenzie seconded the motion, and it was adopted.

### The President's Address.

The President then delivered the following

### INAUGURAL ADDRESS.

Gentlemen,—Before touching on any of the topics to which I propose to briefly make reference on this occasion, allow me to thank you for the honour which you have conferred upon me in asking me to take the chair to-day. As you are aware, our esteemed friend Mr. D. M'Callum, of Omagh, who was to have presided over our deliberations in Dublin last year, was unfortunately unable to do so; and, as Vice-President of the Association, it devolved upon me to take his place. It is very gratifying to me to be, for the second time, in this position; and I trust that, with your kind forbearance, I may be able to discharge to your satisfaction those duties which are expected from your President.

I must confess, at the outset, that it is an exceedingly difficult thing to speak to you in a manner worthy of the occasion, or to supply you with mental food for digestion; for the reason that, not only in England but in Scotland, there are so many kindred Associations to which addresses are delivered and papers read, that it is well nigh impossible to find anything fresh to discourse upon. But, while making this admission, I must at the same time point out that the conditions under which gas is made in Ireland and those which obtain on the other side of the Channel, are vastly dissimilar. The managers of gas-works in Ireland have exceedingly limited constituencies, with perhaps three or four exceptions. We cannot, therefore, put ourselves on a level with our English and Scottish *confrères*. The comparatively limited extent of the works and capital of the gas industry in Ireland does not permit of research on any extensive scale. I am by no means trying to under-estimate the difficulties which beset the Irish gas manager. I wish merely to point out that his opportunities of contributing, in any important degree, to the advancement of the mechanical or commercial departments of the industry, are necessarily circumscribed. At the same time, I am bound to confess that the management of gas undertakings in this country is not so easy a task as one unfamiliar with the precise conditions under which they are conducted would be apt to imagine. Although, in the majority of instances, we have to deal with a limited constituency, we have to satisfy the public with light; and we have to earn for our shareholders, or for the ratepayers, as the case may be, a fair return on the capital employed.

A manager who has only five or six retorts in use in summer, and perhaps only from twelve to eighteen during the period of his maximum supply, may well stand aghast when he hears of works in which one day's manufacture would supply his consumers for six to ten years. Striking though this comparison may appear, it simply means that larger plant has to be employed, with a larger staff of workmen. The man who has the control of these vast undertakings has, no doubt, great responsibilities in seeing that his subordinates perform their duties. But, on the other hand, he is relieved from those cankering cares and petty annoyances which are the daily experience of the manager who has not only to personally attend to his limited number of retorts, but also to read meters, collect accounts, and look after every detail connected with the

business. Having all these duties to perform, I maintain that the manager of small works, such as predominate in Ireland, has infinitely more trouble than one situated in a large town, with the command of a large undertaking. These observations, however, are commonplaces, though I fear that on this occasion I have very little else to offer you.

Looking around us, we can see that there has been something approaching a revolution in gas manufacture. Originally we had the iron retort, which held sway for a very long period, and which, even yet, has its advocates in various parts of the United Kingdom. But it has been almost entirely supplanted by the clay retort. We have had learned papers and discussions on the proper temperature at which to distil coal, as well as a flood of literature on the subject of gas purification, and the subsequent treatment of the tar and ammoniacal liquor; and in all these directions improvements have been, and are still being, made. In a number of cases we have gone from the horizontal to the inclined retort; and we have abandoned manual and adopted mechanical labour. Much of that hand labour, which is a very serious item in the cost of gas, has been dispensed with, and in its place there have been introduced mechanical contrivances, ingenious in their construction and practical in their application, all tending to keep the price of gas at the lowest possible figure.

This brings me to a subject which, even in small works, must play a very important part. As you are all aware, in order to maintain the standard of luminosity which is demanded in Ireland, as in every other part of the United Kingdom, it has hitherto been found necessary to employ a certain percentage of high-class coal or cannel. From that cannel we obtain (say) from 10,000 to 13,000 cubic feet of from 28 to 30 candle gas. The cost of a ton of the material required to produce that high-quality gas has to be seriously considered by all gas managers. Within the last eight years, we have had water gas (which for illuminating purposes must be carburetted) brought under our notice. We have had various patents taken out for such carburation; and a question which every gas manager who supplies gas of high quality has to consider, is whether he shall continue to use cannel to carburet the poor gas which he obtains from ordinary coal, use a better class of coal, or introduce plant to enrich by means of water gas carburetted by oil gas, or by means of oil gas alone. A ton of cannel and a ton of oil cost exactly the same for carriage, yet the one substance will give double the quantity of gas of high luminosity that the other will. The Lowe water-gas plant has been successfully worked in London, and it is now being adopted in Belfast; but, so far, we have had no experience of it in a small works. There is, however, a probability that we shall soon have a statement of experiences from one of our own members, whose output is about 20 million cubic feet per annum. It appears that, owing to short holder accommodation, he has some difficulty in supplying the demand on Saturday nights, which naturally causes a good deal of trouble and anxiety. To meet the difficulty, it is contemplated to erect a carburetted water-gas plant; my friend thinking it better to spend £400 on this plant than £3000 on a new holder.

The two processes which have most largely attracted attention in recent times are the Lewes, patented by that very eminent chemist Professor Vivian B. Lewes—whose paper on enriching coal gas many of us had the pleasure of listening to at the recent meeting of The Gas Institute in Belfast—and the Peebles, identified with the name of Mr. William Young, who has done yoeman service, not only in the distillation of shale for the production of oil, but in the destructive distillation of coal for the production of gas. Mr. Young has identified himself with two Gas Associations in Scotland—the West of Scotland Association of Gas Managers, which is now extinct, and to a great extent with the North British Association of Gas Managers, at whose meeting the other day I observe that he read a paper upon "The Principles of the Production of Illuminating Gas from Liquid Hydrocarbons." I have not seen in operation either of the two processes to which I refer; and consequently I cannot pronounce an opinion as to which will obtain most favour. But it seems to me, judging from the papers which have been read on the subject, and from the discussions to which they have given rise, that Mr. Young's method is more adapted than that of Professor Lewes to the wants of small works. In the event of a sudden demand for light, by reason of fog, Professor Lewes's system would better meet the necessities of the case—that is to say, where storeage accommodation is deficient. It is simple and quick in its action; it gives, within reasonable bounds, a gas of any required luminosity; and it appears to me that the necessary plant cannot be very expensive. On the other hand, where bright weather prevails, Mr. Young's process is more likely to obtain favour. The plant, as in the other case, is inexpensive; there is a minimum of loss in what may be called the fractional distillation of the oil employed; there is an enormous gain in luminosity; and it is in the power of the manager to regulate that luminosity to any desired standard. The plant is easily erected, and is not liable to get out of order; and so far as I can judge, the process must play a very important part in the future of gas undertakings, more particularly in that of small works producing a high-quality gas.

On looking over the paper by Professor Lewes in connection with this process, and the discussion thereon at the recent Institute meeting in Belfast, there appears to be some discrepancy in the various statements, on which, perhaps, further light may be thrown by the papers we are to be favoured with to-day. Professor Lewes says: "In using the Young gas as an enricher, special precautions will have to be taken to ensure perfect admixture with the gas to be enriched. The richness of the gas means that it has a very high specific gravity; and although, theoretically, diffusion should make it possible to produce a perfect mixture of light and heavy gases in a holder, yet in practice every gas manager knows the tendency which variations in specific gravity have to bring about 'layering' in the holder, and to cause considerable variation in the quality of the gas sent out." In answer to this, one of the speakers says that in Peebles, during the summer, gas of 17 candles was made for 24 hours, and then a quantity of oil gas was mixed with it; and there was no difficulty in keeping the quality perfectly regular. This appears to me most remarkable. It must be assumed that the supply to the town is never turned off; and how by working in this manner the gas supply can be kept at a regular quality seems odd, and not in accordance with practice. Take the common method of manufacture, working into and supplying out of one holder. If the retorts are not charged, half the total number at work at a time and at regular intervals, it will be found, even in that short time, that the supply will be variable in quality.

Another question raised in connection with the process was the use of tar instead of oil; one speaker indicating, as the result of observation at Peebles, that satisfactory results can be obtained from tar—"beautiful gas and capital coke." Making gas from tar is not new. At the present time it is carried on with conspicuous success in at least one town in England; but the same process has been tried in other towns, and found not to work satisfactorily. Why it should prove successful in one place and not in another is difficult to understand. One of our members who has tried the process promised to give us an account of his experience; but that promise has, unfortunately, not been redeemed. Perhaps he may be induced to relate them on some future occasion, for the benefit of his fellows; as it often happens that more is learned from experiments which have resulted in failure than from those ending in success. The gasification of tar is of great importance to all gas managers at the present time; and it is to be hoped that we may acquire further knowledge of the subject ere long, as this residual is with most of us a drug in the market, especially where gas-works are far removed from centres of chemical industry. At present the only remedy is to burn the surplus stock; but even then the most that can be realized for it, indirectly, does not exceed 1½d. per gallon.

The Peebles process has, as yet, been adopted only in Scotch works; the chief reason for this being that gas of a high quality —from 25 to 30 candles—has hitherto been supplied in that country. To make this quality necessitates the use of first-class cannels; indeed, in a large number of cases, nothing but cannel was used for many years. Good cannel is, and has been for some time, selling at a price far beyond its value as an enricher; and this renders it necessary to adopt one of two courses—either to lower the illuminating power or to raise the price of gas. The latter course has in many cases been resorted to. The former is very unpopular in Scotland. The public there are used to gas of very high quality; and, according to the advocates of high quality, they "won't be happy till they get it." But it is a moot point whether the game of keeping up a high standard is worth the candle; or, in other words, whether the public get anything like the full lighting value made. As things stand, however, it would appear that Scotch managers must use cannel or enrich by means of oil. The Young process has opportunity here; for there is no doubt that it can enrich to a high degree at a price that will compare favourably with enrichment by cannel.

It seems strange to me that what is considered good gas in England and Ireland is looked upon as inferior in Scotland. Where 17 to 20 candle power is supplied, the public are satisfied. As a matter of fact, 18-candle gas is considered good in England and Ireland; and even in many towns where this is not reached, grumbling is practically unknown. The quality of gas in Ireland, particularly in the North, averages from 17 to 20 candles. To supply this, English coal and cannel were used for a considerable time; but when these ran up in price simultaneously, a substitute was found in first-class Scotch caking coals. Four or five years ago, there was little of this latter description of coal used in Ireland. But last year, I am informed, there were upwards of 100,000 tons carbonized; and this year the quantity will be even larger. There is not much reason for wonder in this, as the price is no higher than that of English coal; and with it a 19-candle standard can easily be maintained without the use of cannel. Such is my own experience for four years; and I am sure that with others it has been similar. When it is further considered that half the cost of coal is covered by the sale of residuals, it does not appear that the Young process of enrichment can be of much practical or economical benefit to us, at least so long as the coals referred to can be had at a moderate price.

There is still another system of enriching, to which attention has not been very prominently directed, and with respect to which I should like to say a few words. I refer to the hydro-oxy gas process. This has been in operation in London; and, as

it is not very well known, I need not apologize for giving you a short description of it. The gas is obtained by retorting mineral oil at low temperatures, and mixing with the resulting non-permanent oil gas, while it is still warm, about 30 to 50 per cent. of oxygen. It is said that, by this process, the lighting capacity of the original oil gas is much increased, and a permanent gas of very high illuminating power is obtained. It is, moreover, claimed for it that the low temperature prevents the deposition of carbon, and renders possible the use of crude, residual, and low-priced oils, in place of the refined and high-priced ones now employed. I have not had the opportunity of seeing this process in operation; but a friend has, and he assures me that, when this enriching gas is mixed with the ordinary product supplied in London, the result, in the way of additional light, is marvellous. I believe plant has been erected at Huddersfield to give the process a trial; and we shall wait with interest the report, which will doubtless be published by Mr. Herring, upon the outcome of his operations.

The use of inclined retorts is extending, although there are differences of opinion as to the advantages and economy attending them. Last year I had the privilege of inspecting a bench of inclined retorts. The stoking was conducted quickly, and with comparative comfort to the men employed. Drawing and charging were performed with a very perceptible absence of fatigue to the men, as compared with what is invariably associated with horizontal retorts and hand-labour. In a neighbouring works charging and drawing horizontal retorts was done by machinery, and, without doubt, in a very expeditious manner. The settings were on the regenerative principle, the heats being very high; and, notwithstanding 6-inch ascension-pipes being fitted to every retort, "chokes" were the order of the day. So frequent were the stoppages, that it appeared to me that the comfort gained by the men in working the machinery was more than counterbalanced by the extra labour entailed in clearing the pipes, and the waste consequent upon opening the lids so often. On inquiry into the cause of the stoppages, I observed that the charges were very light for the size of retorts in use. This, combined with the high heats, was, I believe, the cause of the difficulty. In the retorts the gas is exposed to a species of roasting. Perhaps the best part of the illuminants are decomposed; and the carbon accumulates in the pipes. This exactly coincides with my own experience. Some years ago the experiment was tried of running four-hour charges with Lancashire coal. Retorts hitherto carbonizing a little over 2½ cwt. in six hours, were charged with a little less than 1¾ cwt., working off in four hours. The results were satisfactory for two or three weeks; but after that a most uncomfortable time was experienced. There was hardly a pipe in the retort-house that did not choke at least once every charge. The coal was the same, and there appeared to be no change in the heats; the only difference being four-hour small charges, instead of six-hour usual-sized charges. When the stoppages began, we endeavoured to battle with them for about a week; but, on the old system being reverted to, the trouble gradually disappeared, and was soon a thing of the past.

In this country, where the best lime is to be found, the question of purification does not trouble us much. When I say this, I do not wish it to be inferred that we produce gas and send it to our customers full of impurities. I mean that, by the use of lime, we abstract from the gas, not only the sulphuretted hydrogen, but the carbonic acid with which it is impregnated; obtaining for our spent lime, in many instances, a handsome return, so that the cost of purification per 1000 cubic feet is not a serious consideration. We hear however of new processes, such as the Claus, which is in practical operation at only one works—namely, at Belfast. We have all heard, also, of the Weldon Mud process; and many of us, no doubt, use oxide of iron. All in this room are aware that Ireland supplies not only the best quicklime, but the best bog ore for purification purposes. I shall not, however, dwell on this subject, because, although we all take an interest in the various processes which relate to the economical production of gas, we are not, as a body, called upon to adopt any process of purification of other than that of lime. Members of this Association (especially those who are looking forward to holding more important positions in other parts of the United Kingdom) will find in the pages of our technical journals during the last few months sufficient information on this subject to satisfy them.

In these days when electric lighting is extending at a rapid pace, and we hear of companies, hitherto unable to give any return on the vast capital invested, now paying a small dividend to their shareholders, it behoves us, not only to give careful consideration to the action of electricians, but to do everything that is in our power to forward the interest of our employers, whether those be municipal bodies or public companies. This brings me to the consideration of the question of encouraging the use of gas for other than lighting purposes, which has been frequently and forcibly discussed from every point of view—in other words, whether it is politic to give an abatement of charge to those consumers who use gas during the daytime for cooking or other purposes, as against those who use it as an illuminant only. Of course, we all know that gas-works were primarily erected, and mains and services laid, to supply light; but I think it would be foolish to confine the use of the mains and services to the supply of gas for lighting only. At first sight it appears anomalous that a reduction should be made in the price charged for gas for cooking and heating during the hours of daylight; but then, from the commercial point of view, it is our duty so to employ our plant as to increase our revenue. It seems to me that it is a legitimate way of attaining this end, and at the same time meeting the public wants in the matter of supplying gas for motive power and cooking, to give a slight reduction in charge to day consumers. If we can keep our plant employed during the twenty-four hours of the day, we not only get a larger revenue, but we proportionately reduce our capital outlay. I am therefore of opinion that we should offer inducements to our consumers to use gas during the day.

As we all know, gas sold in the daytime is very profitable; and no pains should be spared to encourage it in every possible manner. Irish towns are, I think, worse than either Scotch or English in neglecting this business. Why this should be so, I have failed to discover. It has been urged that the price of gas is too high; but then coal is proportionately dear. The real cause, I fear, is that both directors and managers simply take no trouble to educate the public in the advantages attendant on the use of gas for heating and cooking purposes. Any efforts made to educate the public in this matter will be amply repaid by increased business and larger profits. On former occasions I have had the privilege of relating the details of our experience in Coleraine in this department. The results have, on the whole, been satisfactory—the increased output enabling, in a great measure, the Commissioners to reduce the price of gas from 5s. to 4s. 2d., and recently to 3s. 9d., with 5 and 10 per cent. discounts; and there is no doubt that the lowering of the price will have a further appreciable effect on the sales. Although we have done fairly well, a good deal more can yet be accomplished; but how best to do it is a matter for consideration. After all the exhibitions and cookery demonstrations we have had, fully three-fourths of the houses are still without gas appliances.

I have sometimes thought that the gas companies in a district should combine, and co-operate with local schools in establishing regular cookery classes; and that they should engage competent lady lecturers to travel from town to town giving lessons in the schools, and in private houses as well. The cost might be defrayed by the association of any number of the local gas companies. I believe the project could be made to work well and satisfactorily. I may say that in Coleraine we are at the present time endeavouring to make some arrangement with one of the local schools; but the expense seems too high for the school. If the managers can only be got to recognize the importance—indeed, the necessity—of teaching cookery in the schools, we may yet have the benefit of a resident lady cook here. In introducing stoves, too much is left to the manufacturers. A great deal is expected of them; and the fact is often ignored that the benefits to be derived from holding exhibitions are mutual. The gas suppliers must enter heartily and actively into the matter; otherwise the public may think that stoves are simply made to sell, and thus defeat the object in view.

In the way of pushing business, a leaf might be taken from the book of the paraffin-oil dealers. Good lamps are sold at an extremely low price; oil is retailed by the pennyworth from door to door; and oil-stoves are frequently found at work, with their characteristic and offensive odour. From time to time we hear of fatal accidents attributed to the use of "cheap lamps;" but it is open to question whether the real cause is not cheap oil, which gives off vapour at a low temperature. The law is such that oils having a flashing-point of 73° Fahr. can be stored and sold; and the bulk of American oil imported gives off vapour at a point little above this. In this country the temperature of the atmosphere is often over 80° Fahr.; and in lamps burning in houses it is considerably more. It is, therefore, not a matter for surprise that lamp accidents are so frequent. The public are ignorant of the danger of using these cheap oils; but are the public to blame entirely? I think not. In a climate such as ours, it is reasonable to assume that 73° Fahr. flashing oil is not safe; still it is sold, and the powers that be authorize the sale. Only oil having a much higher flashing-point should be supplied; and the sooner a change is made, rendering it illegal to sell what is known to be a most dangerous commodity, the better.

Notwithstanding the competition of oil, candles, and the electric light, gas still holds the field. The demand grows larger year after year all over the kingdom. Ten years ago, as shown by the parliamentary returns relating to gas undertakings, £50,250,000 was employed as capital in gas-works, and 7¼ million tons of coal were carbonized annually. Every year there is a large increase. The statistics for 1891-92 show that £63,500,000 of capital was employed; and 11¼ million tons of coal were carbonized. These figures illustrate the gigantic dimensions which gas manufacture and supply have now reached in the United Kingdom; and they point more clearly than any argument to the fact that gas is still the favoured illuminant. To advance its popularity and improve its supply is the aim of each and every one of us; and our assembling here to-day will, I hope, lead to increased energy, and so add—though it may be in a small degree—to the prosperity of the great industry with which we are identified.

During the past year the several associations connected with the gas industry have done a vast amount of useful work; and I am in hopes that to-day will show our own contribution to the total to be no insignificant one. Individually, the societies

have, by their work, justified their existence. Now there is a proposal on foot to bring the ten independent Associations into one great federation. The lines upon which it is proposed to effect this have not yet been formulated. But as a conference upon the subject is called for this month, to be held in London, we shall, no doubt, have further information on an early date. Without expressing any definite opinion one way or the other, I cannot resist saying that a very casual consideration of the subject leads to the conclusion that the federation now desired was practically in existence until a few years ago; and the thought naturally arises whether, seeing it has failed once, it can be expected to be more successful in the future. But this is matter for further consideration, and at present I maintain an open mind upon it.

And now, in conclusion, a word about our own Association. Although we cannot congratulate ourselves on an increase of members, there is every reason for saying that the objects for which the Association was formed are being accomplished. It is a matter of regret that our Southern brethren are yet holding aloof. Perhaps the title "North of Ireland Association" still remains the stumbling-block. If so, the sooner it is changed the better. If the title is not the reason why Southern managers do not join, what is it? Surely they are not waiting for that promised and happy day when the "union of hearts" is to be an accomplished fact. I hope that some steps will shortly be taken with a view to having a thoroughly representative body of Irish gas managers. Although we have done good work in the past, I believe that, if our bounds were extended, the benefits derived, both professionally and socially, would be very much greater. When attending the last meeting of The Gas Institute, in Belfast, I could not but remark that the South of Ireland took a very prominent part in the proceedings, which were so ably conducted by Mr. Denny Lane. When the South can do so well abroad, it is reasonable to hope they may yet consider it their natural duty to lend a helping hand at home.

On the motion of Mr. Ross, seconded by Mr. E. Stears, a hearty vote of thanks was passed to the President for his interesting and instructive address.

The President briefly acknowledged the compliment.

### Reading of Papers.

The reading of papers was then proceeded with. The first was by Mr. C. B. Outon, on "A New Oil-Gas Works Erected at Inchicore, Dublin;" the second, by Mr. A. Main, of Glasgow, on the "History and Development of Gas Cooking." These papers, with the remarks to which they gave rise, will appear in a subsequent issue.

### The Lecture.

A lecture was then delivered by Mr. W. Ivison Macadam, F.R.S.E., of Edinburgh, on "Processes for Manufacturing Gas from Oil," which will be reported later on.

Mr. Whimster said he thought the members would agree with him that they were all deeply indebted to Mr. Macadam for coming to Coleraine to deliver his lecture, to which they had listened with a great deal of pleasure. The subject was one to which they had little access; and it had been very clearly explained. He begged to move that the best thanks of the meeting be given to Mr. Macadam for his valuable services, and also that he be elected an honorary member of the Association.

Mr. Outon seconded the motion; and it was passed by acclamation.

Mr. Macadam acknowledged the compliment, and, in doing so, assured the members of his readiness to render the Association every assistance he could in the way of information or otherwise.

A vote of thanks was also accorded to the President and other officers, for their past services.

The President having briefly replied, the proceedings terminated.

### Presentation to Mr. Whimster.

The members afterwards dined together in the Cloth Workers' Arms Hotel. The proceedings were specially interesting from the fact that the occasion was chosen to recognize, in a tangible manner, the great services rendered to the Association by Mr. Whimster. This was done by the presentation of a handsome gold watch, on which it is intended that the following inscription shall be engraved: "Presented to Jas. Whimster, Armagh, by the North of Ireland Association of Gas Managers, as a token of their appreciation of his services in the formation of the Association in 1887, and his services as Honorary Secretary since. August 8th, 1893." The presentation having been made by the President, Mr. Whimster suitably acknowledged the gift; saying he should prize it not only on account of its intrinsic value, but because he knew it was the expression of real good will and brotherly feeling. He was proud to be looked upon as being in some measure responsible for the formation of the Association, though he often thought the part he then took was no more than just laying hold of the opportunity to organize and direct a spontaneous movement at the time when it was ripe for evolution. He then referred to the first meeting in Armagh; to the subsequent gatherings in Lisburn, Newry, Dundalk, Belfast, Dublin, and Coleraine; and to the social intercourse and good fellowship they had engendered. He thought that, as individuals, they had all profited by the Association, and were, through its influence, better men in relation to their work. He concluded by again thanking the members for their very beautiful gift.

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On the following day, the members and visitors, accompanied by lady friends, had an excursion to the Giant's Causeway.

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**Barrow and the Electric Light.**—After a long discussion, the Barrow Town Council decided, at a recent meeting, not to proceed with a proposed Provisional Order for the supply of electricity. The matter came before the Council in the form of a recommendation from the Gas and Water Committee; and an amendment in favour of the application, on the ground that any private firm should be kept out, was defeated.

**The New Water-Works for Mansfield.**—The Mansfield Town Council have approved of a recommendation of the Water Committee to purchase 3 acres of land at Rainworth, as a site for a pumping-station, from his Grace the Duke of Portland, and have authorized an application to the Local Government Board for sanction to a further loan of £1000—making in all a sum of £26,000 for carrying out the proposed new water-works.

**Manchester Water Supply.**—Last Wednesday, the Manchester Corporation resumed the full supply of water in their district. The service has been curtailed since the 18th of June, when the reservoirs were reported to be exceptionally low. From that time the water has been turned off from 8 p.m. to 5 a.m. Recent rains have rendered this unnecessary; but the Corporation still warn consumers that economy must be exercised, as the stock of water is below the average at this season of the year.

**Failure of the Electric Light at a Conversazione.**—On the occasion of the *conversazione* given to the British Medical Association by the Mayor and Corporation of Newcastle, in the Natural History Museum in that city, on the evening of the 2nd inst., the electric light failed just at the height of the reception, and necessarily caused very great confusion. Fortunately some gas-jets were burning; but the galleries were left in darkness. The *contretemps* is believed to have been due to some defect in the transformers. As the light only returned by fits and starts, candles "sealed with their own dripping to plates," as a local paper described it, were employed to enable the refreshments to be purveyed.

**Water-Works for Radstock.**—An inquiry was held at Radstock on the 4th inst., with reference to an application by the Local Board to the Local Government Board for power to borrow £10,000 for the provision of water-works. The evidence showed that the present supply is derived from wells, most of which are shallow. It is proposed to obtain a supply from a spring at Downhead, the freeholder of which is Lord Portman. According to a provisional agreement entered into with his Lordship, 120,000 gallons of water per day are secured to the town by the payment of £35 per annum. The water is to be collected in 6-inch stoneware pipes, which will be made to discharge into a small intake chamber. From there it will pass to a service reservoir of 50,000 gallons capacity. The total length of the main to the town will be 10¼ miles. The cost of the scheme, it is hoped, will not exceed £9000. Before the inquiry terminated, the Inspector expressed the opinion that the storeage might be increased.

**The Management of the Bangor Gas-Works.**—At the meeting of the Bangor City Council last Wednesday, considerable discussion took place on the report of the Gas Manager (Mr. J. Smith), which came up for adoption on the minutes of the Gas and Water Committee. It was in the first place an explanation of the sudden failures of the gas supply in the town on Feb. 24 and May 31 last. The reason for the deficiency on the first date was attributed to a sudden rise in the consumption, and the foreman stoker not having attended to instructions given to him to increase the quantity of coal used in time to meet it. The second defect was said to be due to the holder syphons not having been properly pumped; the regular stoker being ill at the time, and the man filling his place in the retort-house not understanding what to do in the circumstances. It was suggested that a competent man should reside at the works to attend to the regulation of the pressure when the Manager himself was absent. The latter portion of the report alluded to the sulphate of ammonia plant; and, after referring to some difficulties in the working, stated that the make of sulphate this year was equal in quantity to that of 1891. On the motion of Dr. Langford Jones, the report was referred back to the Committee as being unsatisfactory.

**The Gas and Water Finances of the Bolton Corporation.**—The Bolton Borough Treasurer (Mr. G. Swainson) has just issued his abstract of accounts for the year ending March 25 last. The accounts relating to the gas undertaking show that the manufacture of gas cost £69,464; distribution, £4376; rates and taxes came to £2783; chief rents, to £287; management expenses, to £2049; interest and annuities, to £20,821; sinking fund account, to £1353; reserve fund, to £7500; and the amount transferred in aid of rates, to £14,546. On the other side appear the following items: Gas sold, £99,189; residual products, £18,851; gas-fitting trade, £1531; and £64 for hire of working appliances. The total income was £123,183, as compared with £127,209 last year. The water-works stand second in importance as a source of revenue to the Corporation. The income on this account was £54,884 in the past year, as compared with £53,675 in the previous twelve months. The amount transferred in aid of rates was £11,527, as against £11,100 in 1891-2. The expenditure included £1963 for salaries, £6344 for maintenance of works, £2650 for rates and taxes, £1077 for rents, and £25,374 for interest, compensation, and office and general charges. The renewal of water-mains involved an outlay of £1120; the Wayoh bye-wash cost £1538. A sum of £3452 was spent on the extension of mains; and one of £1040 on the Entwistle reservoir. The Corporation have decided to apply to the Local Government Board for power to borrow £5454 for new mains, and £20,000 for additional works at Entwistle.

# CORRESPONDENCE.

[*We are not responsible for the opinions expressed by our correspondents.*]

## Automatic Prepayment Meters.

SIR,—Your article on "Automatic Meters" seems written with the object of inviting discussion, and puts those who have adopted the system upon their defence.

First I would ask, Is it wise in London, where neither fittings nor tubing are to be found in the houses, to obtain small consumers; and if so, will the plan be financially successful? Only those who have tried to obtain consumers among weekly tenants, know what a difficult matter it is. Many plans have been suggested that will be of little value unless the house is fitted without any cost or responsibility to the tenant. The gas must be brought into the room, and the would-be consumer invited to take it or leave it as he likes. That gas will be consumed by a very large number who do not now use it, is very evident by the great demand for these meters. It is at present so large that the meter-makers, after many months, are still quite unable to cope with it.

The objections raised in your article seem to be: Defects of meters—with which should be included discrepancy between money and gas-index. The difficulty of dealing with coppers. The small amount purchased for the penny unit. And, perhaps, to this list should be added fraud.

Dealing with the defects in meters. The first meters supplied were certainly very erratic; but there has been continued improvement in this respect. The number of defective meters is now (with the best makers) only 7 per cent. of the total supplied. It is higher with some undoubtedly; but as the carriage of these meters to and fro, and the cost of repairing, falls upon the manufacturer, it is a matter that should soon right itself.

Money received in bronze coin is looked upon by some as a very weighty difficulty. When travelling in Italy, though we have not the weight to contend with, we are apt to consider dirty notes of small value as very "filthy lucre;" but we get over the difficulty in some way. There are many methods of disposing of coppers. Some people require them in their daily transactions; and some do not. But even if a small premium is paid to dispose of them, it is not a very serious matter.

You complain of the small amount of gas purchased for the penny unit. But surely if the pennyworth is sufficient to supply light on a summer evening for a family and cook the food, you will find the consumer will not complain; though it is quite possible that the gas company would not be satisfied if all consumers did likewise.

The question of fraud has often been raised; and when there has been a case, much has been made of it. With an experience of 4000 consumers, the South Metropolitan Company have not had one single case reported. The question of the lights going out when the pennyworth is consumed is no longer a difficulty, as the meters of nearly all makers give a warning when nearly all the gas is consumed.

The financial question is, of course, the all-important one; for additional consumers will most certainly add to the number of complaints, and if they do not add to the profits, the gas undertaking is better without them.

If I had been asked some months ago to state what would be the annual rental of these consumers, I should have said about 35s. With extended experience, I now say 42s.; and probably even more. Taking 42s., 9s. 11d. represents the hire of fittings and meter, leaving 32s. for gas. This will give more than 12 per cent. interest to pay for rental of meter, together with rental aud renewal of fittings, and additional cost of collection. The rental will not stop, however, at 42s.; for there is now a great demand for a small cooking stove which is supplied, when required, in place of a ring burner.

I am not writing this letter to persuade others to adopt the plan; for the demand for meters is large enough as it is. My advice rather would be: Do not start this system till the meters are more perfect, and you feel sure of getting them when they are ordered.

FRANK LIVESEY.

*Aug.* 12, 1893.

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SIR,—In the last issue of the JOURNAL, I noticed an article appearing under the heading of "Automatic Prepayment Gas-Meters." Many objections were raised to the "penny-in-the-slot" system; but in some matters connected therewith, you are entirely misinformed. As you invite comments, I will endeavour to meet the objections raised.

In the first place, you state that "dry meters" are as yet the only type of meter to which the "penny-in-the-slot" system has been applied. In this you are in error, as the first fifty automatic meters ever fixed were wet meters, and were manufactured under license of patents now held by my Company; and we are making both wet and dry penny-in-the-slot meters.

From your remarks on the automatic type of meter, and its relation to unaccounted-for gas, the inference a reader would draw is that the use of an automatic meter would have some effect upon the distribution department, and cause greater labour to a gas manager striving to reduce his leakage. There should not be the slightest difference in the amount of unaccounted-for gas whether the gas is sold through an ordinary meter or an automatic prepayment meter. If, however, the arrangement for shutting off the supply of gas when the quantity paid for has been used is not perfect, then there would be leakage. Thus, if in an automatic meter the supply of gas is stopped by holding the tangent of a dry meter, leakage will surely occur sooner or later; but if a gradually closing valve, of correct formation, is used, there is not the slightest risk of increasing the leakage over and above that found in the usual ordinary system.

In writing upon the popularity of the "pennyworth," you observe that the popularity of a system such as the automatic prepayment one is liable to a sudden decrease; and doubt is thrown upon the probable ultimate financial success of a scheme which relies for its profit upon the sale of pennyworths. In meeting this objection, I would simply remark that the use of oil as an illuminant in the smaller class of houses is almost entirely due to the ease with which it can be obtained by the pennyworth; and gas managers are certainly well aware of the success that has attended the efforts of the oil merchants who vend their commodity in small quantities, and know that the popularity of the oil-vending system has never yet been on the wane.

The class that I will term oil consumers are generally either poor or improvident; and the gas companies do not find themselves warranted in supplying them with gas without a deposit has been paid. Their custom is, therefore, lost; as they are unwilling or unable to pay a deposit, and have in many instances an objection to running into debt. Speaking from experience, I have no hesitation in saying that these people, when once obtained as customers by a gas company, are far larger users than their more careful and provident neighbours.

You speak of the unit of value being painfully small. The unit of value in gas when compared with the unit of value in oil is not small. The average amount of gas given throughout the United Kingdom being taken at 25 cubic feet for 1d., the purchaser has in exchange for the coin a sufficient amount of gas to yield a fair average light for five hours—a duty that is unequalled for the money expended by any other illuminant.

The next point you raise is rather humorous; and I will term it the "handcart objection." I think that I may with confidence leave the solution of the problem as to what must be done with the coins to yourself, seeing that the great bulk of the copper coins of this country passes through the hands of the proprietors of the press. I have not yet heard of any case where the humble but useful penny has been refused; and certainly some of the largest fortunes in the country have been accumulated by people who have had the handling of the penny-piece.

One of the greatest objections raised in the article is to the "draught" of the automatic meter. The term is one which I have had considerable difficulty in understanding; but it would seem that you are of opinion that there is a certain unusable residuum of gas in each pennyworth paid for. There is no such thing in the meter manufactured by my Company. A residuum generally remains of the first pennyworth paid for, but never afterwards on the insertion of other coins. This residuum can be utilized if the consumer thinks fit to burn his light until the supply of gas is shut off by the meter; but the amount of this residuum, being only about 1½ cubic feet, is not worth consideration.

Another point raised is as to whether the automatic gas-meters are as dishonest as some of the sweetstuff machines are found to be, and following the same rule, decline to yield value for coins inserted. Replying to this, I would say that defects are inseparable from the introduction of any machine; but for that reason the use of machinery has not been discredited, and makers and users alike have joined in perfecting the same. In the case of automatic meters, the demand rose quickly. and had to be met. Tools of precision, and special machinery, have been designed and made for the production of these meters; and this could not be done on the instant. In the case of my own Company, having now fitted up these appliances, I claim that we produce an instrument in the use of which there is no fear whatever of failures in action, which are the cause of the defects to which you allude.

As a special addition to our "penny-in-the-slot" meter, there has been added a £ *s. d.* dial, which records the exact number of coins put into the box of the meter from the commencement of its operations. This acts as a complete check against any attempts at fraud, either by consumers, collectors, or others.

In conclusion, I may mention that the first wet meters sent out were provided with a patented arrangement for altering *in situ* the amount of gas given for one penny.

From your remarks, I gather that you have an objection to any system hinging upon the use of any particular machine. Having in this matter expended a very large amount of time and a considerable sum of money, I am sure that inventors at any rate will agree with me in thinking that it is not at all unfair to expect some results in return for the labour expended, and to expect to receive a certain monopoly even at the expense of the public.

THOS. G. MARSH, Engineer and Manager,
Automatic Gas-Meter Company, Limited.

*Manchester, Aug.* 11, 1893.

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Writing on the same subject, the Secretary of a Gas Company in the Midlands remarks that, if "penny-in-the-slot" meters are adopted, somebody must be sent more frequently than once a quarter to clear cut the coppers. This, he points out, will take the inspector as long, or nearly so, as to adopt the system of weekly or monthly accounts in use by his Company. In the former case, the service-pipes and meter are fixed free, and the meter is read and the quantity of gas used paid for every week, at the rate of 4d. per 1000 cubic feet; any difference between that price and the current charge for gas being allowed at the end of each quarter. A penny per week is charged for the hire of the meter. No account is allowed to run more than two weeks. If not then paid, the supply of gas is suspended without notice until the debt is discharged. In the case of monthly accounts, the inspector makes out the bill and takes the cash then and there, if the consumer likes to pay (which many do); otherwise it has to be paid at the office within 14 days to secure the cash discount of 2d. per 1000 cubic feet. The effect of these short accounts is to reduce the arrears of bad debts very considerably. Nearly all the new customers are being put on monthly accounts; those in an out-district being exclusively on these terms. The system of weekly accounts is, however, not much used—the population not being of a class to require it. But the writer believes it to be preferable to the "penny-in-the-slot" plan, first of all because it would not be more expensive, and next because it would bring about personal intercourse with a customer, which is certainly worth something.

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**The Southport Rating Appeal Case.**—The appeal of the Ormskirk Assessment Committee and the Overseers of Birkdale against the order made by Justices Cave and Wright on the 17th ult. (see *ante*, p. 173) was recently among the cases to come before the Court of Appeal; but it was decided that it should stand over till next sittings.

# PARLIAMENTARY INTELLIGENCE.

## HOUSE OF LORDS.

### Monday, Aug. 7.

LONDON COUNTY COUNCIL (GENERAL POWERS) BILL.

On the order of the day for the consideration of the Commons' amendments to the Lords' amendments, and the Commons' reasons for disagreeing to some of the Lords' amendments,

The Earl of MORLEY said there were three points involved in the amendments he proposed to move. The first was the representation of the London County Council on the Thames Conservancy Board; the second, the representation of the Council on the Lea Conservancy Board; and the third, the sum to be spent on investigations by the Council. When the Bill came before their Lordships' House, it was referred to a Committee over which the Duke of Richmond presided; and they rejected the amendment as to the first point, on the ground that other parties who ought to be represented would not be. When the Bill went back to the Commons, they restored the amendment, though he ventured to think they would have done better if, instead of insisting on its reinsertion, they had amended it. He had had an opportunity of conferring on the subject with the authorities of the House and the President of the Local Government Board; and the result was the amendments of which he had given notice. It was proposed, with regard to the Thames Conservancy Board, that, instead of four representatives, the London County Council should have three, and that these should be reinforced by a single representative from each of the four riparian counties of the lower navigation. It was proposed that this arrangement should be in force for three years only, and that next year the Thames Conservancy Board should introduce a Bill to amend the Public and Private Acts dealing with its constitution and powers. He would have much preferred that any amendments should be proposed after an inquiry had been held. But this was not the opinion of others; and therefore it appeared to him that they should come to a decision without prejudice to the course to be eventually taken. Next year, as he had said, the Thames Conservancy Board would bring in a Bill dealing with their constitution and powers; and, if they failed to do so, authority was given to the London County Council to introduce a Bill either next or the following session, or the session after that. With regard to the Lea, he advised the House to adhere to its decision. He ventured to think that there was no cause to interfere with the constitution of the Lea Conservancy, at least until an investigation as to the powers and constitution of the Board should be made. With respect to the third point, the London County Council had asked to be allowed to spend £10,000 a year on investigations and negotiations which affected the interests of their constituents; but it was now proposed that the sum should not exceed £1000, unless with the assent of the Local Government Board. He would move that the provision as to expending a further sum with the assent of the Local Government Board should be struck out, so that not more than £1000 a year should be spent on investigations; and the Council were willing to accept this compromise. He begged to move the amendments of which he had given notice.

Viscount HAMPDEN observed that there were other interests concerned; and if it had been known that a compromise of this kind was going to be effected on the basis suggested, the interests would certainly have made a claim to be heard. The London Water Companies paid many thousands a year to the Thames Conservancy Board, and were more interested than any other bodies in the maintenance of the purity of the river; and as the representative element was going to be introduced on the Board, and the degree of representation was to be extended, he submitted that the Companies had a very strong claim to representation. As he understood that it was too late now to suggest any amendment to the Bill, he would content himself by simply entering a *caveat* to the effect that the other bodies referred to, including the London Water Companies, could not regard any settlement of the question as satisfactory or permanent which did not fully recognize their interests and admit their claim to a share of representation on the Conservancy Board.

The Earl of JERSEY asked the Chairman of Committees whether even then, at the last moment, it was not possible to give representation on the Board to the counties of Berks, Bucks, and Oxford.

The Earl of MORLEY said he feared it would be impossible to comply with this suggestion; and he pointed out that there was this difference between the three counties mentioned and the four referred to in the amendment—that the direct interests of the former were confined to the upper reaches of the Thames, and that they were already represented on the Board by four members. He quite admitted that the constituencies from which these members were elected might not be wholly satisfactory; but there was that distinction. Still, he thought the question was one which might be fairly considered when the forthcoming Bill was before Parliament. He himself should have refused to move the amendments he then submitted to their lordships unless he had clearly understood that the present arrangement was of a temporary character, and that the whole question relating to the Conservancy Board would be opened before very long.

The motions and amendments of the Earl of Morley were then agreed to.

## HOUSE OF COMMONS.

### Friday, Aug. 11.

LONDON COUNTY COUNCIL (GENERAL POWERS) BILL.

On the consideration of the Lords' amendments to the Commons' amendments to the Lords' amendments to this Bill,

Mr. SNAPE expressed his regret that the decision which a Committee of the House of Commons had unanimously arrived, at after a long hearing, as to the representation of the London County Council on the Thames and Lea Conservancy Boards, had not been absolutely adhered to.

Mr. BENN, who had a motion down to move the rejection of the Lords' amendments, said he would not persevere with his proposal; but, on behalf of the people of the East-end of London, he protested against the compromise arrived at with the Lords, especially in so far as it related to a refusal of the Upper House to increase the County Council's representation on the Conservancy of the Lea.

Mr. H. H. FOWLER said compromises between Houses of Parliament, as between individuals, meant concessions on both sides. The arrangement come to must be regarded as of a provisional character, as it was only to last for three years. There was a clause in the Bill making it compulsory on the Thames Conservancy to come to Parliament next session with a Bill which would raise the whole question of the representation on the Board. If they omitted to do this, the County Council could bring in a Bill dealing with the matter in the following session. As to the Lea Conservancy, the House of Lords considered that the question of the increased County Council representation on that Board should be deferred until there had been an inquiry into the whole matter of the conservancy of that river.

Lord G. HAMILTON, on behalf of the County of Middlesex, expressed his satisfaction at the compromise arrived at.

Mr. BARTLEY considered the action of the House of Lords had brought about a far more equitable basis of representation on the Thames Conservancy Board than was proposed in the Bill originally.

Sir J. LUBBOCK, for the County Council, thanked the President of the Local Government Board for the assistance he had rendered in bringing about the compromise. At the same time, he did not wonder at the action of his honourable friend (Mr. Benn), seeing the importance of the purity of the River Lea to the people of the East-end of London.

Sir R. TEMPLE, as the representative of a Surrey constituency, approved the compromise.

The Lords' amendments were then agreed to.

# LEGAL INTELLIGENCE.

## HIGH COURT OF JUSTICE—CHANCERY DIVISION.

### Wednesday, Aug. 9.

(*Before Mr. Justice* KEKEWICH.)

**North British Water-Gas Syndicate, Limited, v. British Water-Gas Syndicate, Limited.**

In this action, Mr. RENSHAW, Q.C., moved, on behalf of the plaintiffs, that it might be dismissed as having been commenced in their names without their authority. He said the writ was issued on the 27th of June last, and by it the plaintiffs claimed to have two agreements, both dated in May, 1889, and a deed dated August, 1889, rescinded and set aside, on the ground that the same were procured by false representations made by the defendants and their agents, and also asking for the return of £175,000 and other moneys paid thereunder. These agreements were made immediately before the formation of the plaintiff Company, and the deed was to carry out these agreements in part—the Company being incorporated in May, 1889; so that four years ran before these proceedings were commenced.

Mr. WARMINGTON, Q.C., for the defendants, said they admitted that the action was begun in the name of the plaintiff Company without the consent of the Directors. The point they raised was whether directions should be given to hold a meeting of the shareholders.

Mr. RENSHAW said there were propositions for the amalgamation of this and other Companies, including the parent Company, and involving four such undertakings. In June last the principles of that scheme were reduced to writing; and towards the end of the month a resolution was passed by the shareholders of the Company approving of the terms. At the meeting called for this purpose, Mr. Allan (who was the true plaintiff in the case) proposed an amendment, authorizing the suing of the old Company, the present defendants. But, on a poll, the resolution was passed approving the terms of the amalgamation; and in July it was affirmed *nem. con.* at another meeting. His learned friend represented a small minority of the shareholders headed by Mr. Allan; and the plaintiffs feared that the result of continuing this disagreement might be the breaking down of the amalgamation scheme, which had been arrived at after a good deal of agitation and trouble.

Mr. WARMINGTON (with him Mr. MACKASIE) was heard at some length in stating the defendants' views, the chief of which was that the majority by which the resolution was carried was largely influenced by proxies, the legality of some of which were questioned. They added that, assuming his Lordship should grant the application, it would not stop the proceedings, as another writ would be promptly issued.

After considerable argument and deliberation,

His LORDSHIP said he did not see how he could direct a meeting to be called, even if he thought it advisable that such a course should be taken. Being satisfied that the action ought not to proceed in its present form, he granted the order asked for in the notice of motion.

## LIVERPOOL ASSIZES.—Monday, Aug. 7.

(*Before Mr. Justice* LAWRANCE.)

**Cropper v. Tempest and the Corporation of Bury.**

**Fouling a Stream During the Construction of a Reservoir.**

The plaintiff in this action is a farmer near Newchurch, Rossendale; and through the middle of his holding runs a stream called the Whitewell Brook, at which he used to water his cattle. In December, 1888, the Corporation of Bury determined to erect certain water-works and proposed to construct a large reservoir upon the Whitewell Brook, a little distance from the plaintiff's farm. An Act of Parliament was obtained; and an agreement was entered into with the defendant Tempest to carry out the work. A clause in the Act provided that, during the progress of the work, the contractors must make such arrangements to prevent the fouling of the brook, as the engineer might require; but, on behalf of the plaintiff, it was alleged that, some time

after the commencement of the work, the stream became charged with lime and cement from the reservoir. Several of the plaintiff's cattle subsequently died; and a few months later he was compelled to sell off the remainder of his stock, and to discontinue that portion of his business which consisted of rearing cattle and dealing in milk and butter. A number of witnesses, including several professional gentlemen who had analyzed samples of water taken from the brook, were called on behalf of the plaintiff. The samples were discoloured, and showed a quantity of sediment at the bottom. On the other hand, witnesses for the defendants produced samples which appeared to be perfectly clear.

Mr. M'CALL, Q.C., and Mr. PARRY appeared for the plaintiff; Mr. GULLY, Q.C., M.P., and Mr. BRADBURY for Mr. Tempest; and Mr. BIGHAM, Q.C., and Mr. SUTTON for the Corporation of Bury.

Mr. GULLY, on behalf of Mr. Tempest, contended that the plaintiff, being an elderly man and in poor health, had reasons, from an agricultural point of view, for selling off his stock, but had no shadow of an excuse for doing so owing to the alleged fouling of the stream. No complaint was made by him until the month of June, 1892, when he then said that he had been obliged to sell his cattle in 1891, and had lost on the sale in consequence of the brook having been fouled. As a matter of fact, the defendant was not at that time using cement; and there was no lime at the works. At the most the brook could only have become muddy through the digging operations. He submitted that the water was not made obnoxious or harmful by any temporary fouling from the works, and did not cause damage to other farmers who used the stream. He further contended that reasonable and proper precautions were taken to prevent the fouling of the water, and that no matter of an objectionable nature was allowed to enter the stream.

Mr. SUTTON addressed the Court on the point as to whether his clients had taken all reasonable and proper precautions to avoid the stream becoming fouled. That they did, he submitted, was perfectly plain, for they engaged Tempest, an experienced contractor, to carry out the work, and paid every attention to the suggestions made by plaintiff. He contended that the Corporation were not liable.

His LORDSHIP, in giving his decision, said that, in questions affecting the condition of water, horses, and a few other matters, it seemed at times impossible to get at the truth. If in this case he believed one side, a fouler stream than this was never seen; and, if he believed the other side, a cleaner and more beautiful stream than this never existed. He distrusted the scientific evidence which had been given, and had resolved to use his own common-sense in dealing with the case. He had arrived at the conclusion that the plaintiff had made out his case; that the illness of his cattle was caused by some irritating grit or something of the kind which was in the water; and that there was no doubt it might have been stopped. He gave judgment for the plaintiff for £120, with costs.

**The Miners' Strike and the Increased Use of Coke.**—In our remarks last week on the miners' strike, reference was made to the increased use of coke for domestic purposes, owing to the enhanced price of coal consequent upon the strike. Some remarks made by Mr. Charles Sellers, Engineer and Secretary of the York Gas Company, at their recent meeting, may be appropriately quoted in this connection. Mr. Sellers was asked by a shareholder if he had had any general expression of opinion on the part of the public as to the use of the Company's coke, as a gentleman who had burnt it in slow-combustion stoves had informed him that it gave results much in advance of coal as a fuel. Mr. Sellers replied that the Company's coke was very largely used for domestic purposes, and was an excellent fuel, especially adapted for the slow-combustion and semi-slow-combustion stoves now generally fixed in all rooms other than kitchens. There was still, however, a prejudice in the minds of some people against coke; but when that was inquired into, it was found to exist only among those people who had never used the material, and who knew nothing of its value. He could understand the objection to coke for household purposes when it required breaking; but the Company not only broke the coke so as to be suitable for domestic grates, but freed it from dust by screening it, and consequently such objection was removed. Another thing which applied in the comparison of coal and coke was this: Where coal was put into an open grate, the fire was never the brightest and hottest until the gas and smoke had been driven off, and the coal practically reduced to coke; whereas when coke was used, the fire was bright and hot from the first, and, in slow-combustion stoves, as long as there was a bit of fuel left.

**Saltley (Birmingham) Gas-Works and the Hospital Saturday Fund.**—The annual meeting of the Saltley Gas-Works Hospital Saturday Fund was held last Thursday week, under the presidency of Mr. H. Hack, the Engineer of the works. The accounts submitted showed that the subscriptions during the year amounted to £125 9s. 5d., which, added to the balance (£20) brought forward from the previous year, with £2 0s. 11d. interest, made a total of £147 10s. 4d. Out of this the Committee had expended £40 1s. in hospital and dispensary notes, and had voted £80 to the Hospital Saturday Fund, and £2 to the building fund of the Ear and Throat Hospital; the balance being carried forward. In moving the adoption of the report and accounts, the Chairman congratulated the members upon the large amount subscribed, which had enabled them to hand over to the general fund such a handsome contribution, after providing for all their own wants in the way of hospital notes. Contrasting the average amount subscribed under the old plan of a collection once a year, he said that £7 1s. 4d. was all they were then able to pass over to the general fund; while the average sum realized per annum since the introduction of the monthly contributions amounted to £95 19s. 8d., out of which they had been able to send an average annual contribution to the general fund of £53 3s. 7d., besides expending £40 6s. 1d. yearly in the purchase of tickets for themselves and wives. The motion was carried. Before dispersing, the Chairman alluded to the great loss the city had sustained in the untimely death of Sir Thomas Martineau; and a resolution was passed recording the regret with which the members of the fund heard of his death, and offering their sincerest sympathy to Lady Martineau and her family in their bereavement.

# MISCELLANEOUS NEWS.

## PROVINCIAL GAS AND WATER COMPANIES.

Following our usual custom, we shall be giving, in the next few issues of the JOURNAL, under the above heading, the most interesting points of the various reports and accounts of provincial gas and water companies which may reach us.

### Gas Companies.

The report submitted by the Directors of the Bury St. Edmunds Gas Company at the half-yearly meeting of the shareholders last Friday week was not quite so satisfactory as usual. The high price of coal during the past year, and the low value of residual products, rendered it necessary for the Board to propose a reduction in the dividend; but, having recently made a favourable contract for coals, they expressed the hope that the reduction might be only temporary. The payment of a dividend for the six months of 11s. per share on the 1849 capital, 8s. 6d. per share on the 1859 capital, and 8s. per share on the 1879 capital (free of income-tax) was agreed to.

The annual meeting of the Maidstone Gas Company was held last Thursday week, when the report and accounts submitted by the Directors showed that the business still continued to increase. The working of the concern during the past twelve months gave the Company a balance of £12,234; and the Directors recommended the declaration of a dividend (less income-tax) at the rate of 10¾ per cent. per annum, of which 5 per cent. was paid in March last. In moving the adoption of the report, the Chairman (Mr. Ambrose Warde) said it would be seen that the net revenue was £12,234; and the Directors recommended a dividend of 10¾ per cent. The amount of dividend paid last March (£3536) was not included in the sum they had now to dispose of. This half year they were paying ¾ per cent. more than last; and this would mean £4140. Deducting this from the balance would leave £8094 to be carried forward; and this, he was glad to tell the shareholders, was more than enough to pay a similar dividend next year. This was a satisfactory state of things; and especially seeing that that day they proposed selling £3000 additional stock. The coal contract for next year was 2s. per ton less than it was last year; and this would make a considerable addition to the profits. The actual profit last year was £7875. They would require a little more profit in the current year to pay the extra dividend; but he was certain the profits would increase, and exceed far more than they would need, and that they would not have to touch the balance this year, which would be carried forward to the reserve fund. With regard to the proposed increase in the capital, he explained that this was wanted for new buildings, which they hoped would carry them on for another ten years to come. Their supply of gas had increased 2½ per cent. during the year. The report was adopted; and, after some formal business was transacted, an extraordinary meeting was held, at which a resolution was passed authorizing the issue of £3000 additional consolidated stock, and the raising on mortgage of £1500 (or other sum not exceeding one-fourth of the sum to be received on the sale of the new stock, including premiums), at 3½ per cent. per annum.

The Directors of the Malton Gas Company report a profit for the past six months of £1154. There has been a small increase in the receipts for gas and residuals. The balance brought forward from the previous accounts added to the profit of the half year makes an available sum of £1686, from which the Directors propose a dividend of 10s. per share on the fully-paid shares and of 6s. per share on the new shares (free of income-tax), which will leave £595. Coal for the current twelve months has been contracted for at a reduced price.

Reporting upon the working of the Newport Gas Company during the last six months, the Directors state that the balance of profit is £4604, or £955 greater than for the corresponding half of 1892. There was a considerable reduction in the expenditure, principally owing to the lower price of coal; and in this way the greater profit is nearly accounted for. The revenue amounted to £18,854, or an increase of about £200. The income for gas and meter-rental was £556 more; but the demand for residual products declined to the extent of £456. The new works at Crindau are progressing satisfactorily; but the new gasholder tank has not yet been taken over from the contractors. The usual maximum dividends are recommended.

At the meeting of the Poole Gas Company, Limited, yesterday, the Directors had the pleasure of reporting that the revenue account for the past half year presented a balance of profit amounting to £1061, as against £1028 for the corresponding period of last year, or an increase of £32, notwithstanding a reduction in the price of 3d. per 1000 cubic feet from the commencement of the June quarter. The balance of net profit enabled the Directors to recommend the payment of the maximum dividends (less income-tax) upon the whole of the stock and shares. With regard to the works, a new retort-house was completed during the half year, and the retort-settings are now in progress, for which work further capital is required.

The half-yearly meeting of the Scarborough Gas Company was held last Saturday. The Directors reported that the net revenue, including £1772 brought from the previous accounts, and after deducting all interest charges for the half year, was £5416. Out of this sum, after providing for the dividend on the preference stock, they recommended the maximum dividends on all other stocks of the Company. The payment of these dividends, it was stated, would absorb £5141; leaving a balance of £275 to be carried forward. During the six months, it had been necessary to renew one of the two benches in No. 1 retort-house, both of which have been in continuous operation since the completion of the new works in 1875. The expenditure in connection therewith, and the lower receipts for tar and ammoniacal liquor, was mainly responsible for the reduced profit on the half-year's working. The Directors also mentioned that the new contracts for coal had been entered into upon better terms than last year; but the prices obtained for tar and liquor, owing to the continued depression in the chemical market, showed very little improvement. The gratifying announcement was made that the number of general consumers, and the demand for cooking-stoves, gas-fires, and other appliances, continued to increase in a satisfactory manner.

The shareholders of the Westhoughton Gas Company held their half-yearly meeting last Thursday week. In their report, the Directors regretted that, owing to the state of trade and some of the mills running short time during a few months in the winter—thus necessitating the use of less gas—together with the low prices obtainable for tar, the available balance of profit had been much reduced. The total receipts on revenue account during the half year were £1397, against £1601 for the corresponding six months of 1892, and the total expenses amounted to £982, as compared with £1018. After writing off the working expenses for the last six months, there was a balance of £415, which was reduced by interest due on loans to £322, which, added to £600 brought from the previous half-year's accounts, made a disposable balance of £962, out of which the Directors recommended the shareholders to declare a dividend at the rate of 3 per cent. per annum on all the share capital called up (which amounts to nearly £21,000). The report was adopted, and the dividend recommended was duly declared. (This is 2 per cent. less than has been paid by the Company during the past two or three years.)

**Water Companies.**

The report which will be submitted at the meeting of the Camborne Water Company to-day states that the revenue account shows a disposable balance of £682, out of which the Directors propose the payment of dividends at the rates of 8 per cent. per annum on the "A" shares and £5 12s. per cent. on the "B" issue, both free of income-tax. The remainder of the report refers to the steps which the Directors have taken to improve the supply. Arrangements have been made to add the Boswyn stream to the present source of supply; plans are being drawn up for the construction of a small reservoir; and two new lines of mains have been laid—one (9-inch) 2800 yards in length, and the other (4-inch) about two miles. The estimated cost of utilizing the Boswyn stream is £2000.

The ordinary half-yearly meeting of the Chester Water Company was held last Thursday. The Directors' report showed a surplus of revenue over expenditure of £2757, which, with the balance of £4509 brought forward, made a total of £7266. The interest on preference capital required £450; so that there was a balance of £6816 available for division. A dividend was recommended at the rate of 7½ per cent. per annum, free of income-tax, upon the consolidated stock, and 7 per cent. per annum upon the new ordinary stock of 1874, amounting to £1890, and carrying forward £4926. The Directors stated that during the six months they had expended a considerable amount of money in effectually straining the water at the intake, and also in the improvement of the filtration, in order to render it as perfect as possible. The microscopic examinations made from time to time showed a great improvement in the quality of the water delivered. The report was adopted.

The half-yearly report of the Directors of the Consett Water Company shows an undivided profit of £7084; and they recommend the payment of a dividend (clear of income-tax) of 7 per cent. per annum, absorbing £5915. Of the balance, £1000 is to be placed to the reserve fund.

The Directors of the South Staffordshire Water Company report that during the past half year the number of houses laid on was 1321; making the total supplied 79,415. The gross amount of water-rates for the six months was £40,186, as against £39,028 in the corresponding period of 1892. After providing for interest on debenture and preference stock, the amount remaining for division (including £3217 brought from the preceding half year) is £18,386; and the Directors recommend the declaration of a dividend on the ordinary stocks at the rate of 5⅝ per cent. per annum, less income-tax. The amount of this dividend being £15,384, there will remain £3001 for the credit of next half year. At an extraordinary meeting to be held immediately after the ordinary meeting on the 24th inst., it will be proposed to create £50,000 of the £150,000 of new stock authorized by the Company's Act of 1893, and to empower the Directors to issue it by public auction or by tender as new ordinary "B" stock, entitled to a dividend not exceeding 7 per cent. per annum; also to sanction the creation of debenture stock to the amount the Company are authorized to borrow on mortgage in respect of the additional capital for the time being raised under the Act of 1893.

The Truro Water Company continue to make progress, though only in a small degree. It was reported at the meeting of the shareholders last Tuesday that during the past half year 59 new services and 11 extra supplies had been connected; and that the receipts amounted to £869, and the expenditure to £582. The Directors recommended a dividend at the rate of 2½ per cent. per annum, leaving a balance of £120 to be carried forward. The Chairman (Mr. A. C. Willyams), in moving the adoption of the report, said that, in accordance with a resolution passed at the previous meeting, £600 had been applied to the reduction of the excess of capital, making a total reduction in this direction since the works were taken over by the present Company of £1600. During the same period, they paid off the water-wheel account, amounting to £312; so that nearly £2000 had been applied to the capital account. The shareholders, he thought, might congratulate themselves on being able to do this, and at the same time to maintain a dividend of 2½ per cent.

## THE MANAGEMENT OF THE RAMSGATE GAS AND WATER WORKS.

**Satisfactory Report by Mr. T. Newbigging.**

A short time ago, complaints were made by certain members of the Ramsgate Corporation as to the management of the gas and water works, which, as our readers are aware, are under the supervision of Mr. W. A. Valon, J.P. The outcome of the commotion raised was a decision that an investigation should be made by some competent engineer; and Mr. T. Newbigging, M.Inst.C.E., was asked to undertake it. He accepted the duty; and accordingly he attended at Ramsgate for several days early in June for the purpose of going over the works, examining the books, and hearing any complaints. A public inquiry was held, in order that the burgesses might have an opportunity of bringing forward their grievances; and this they were invited to do by advertisements and placards. In addition to the members of the Council, only two responded, one of whom expressed general satisfaction with the management of the two departments (his only complaint being that the men were not paid well enough); while the other found fault with the hardness of the water, which he proposed to improve by a method of his own. Mr. Newbigging decided that neither of these matters came within the scope of his inquiry. The principal grounds of complaint were that Mr. Valon did not give the whole of his time to the Corporation; that the works were expensive, and could be better managed; that a manager who could take off his coat and "do his bit" was what was wanted; that the profits were artificially inflated; that the works were practically of no advantage to the ratepayers; that if the Engineer gave his whole time to the works, the profit would be considerably increased, which would result in a benefit of 2d. in the pound to the rates; and, finally, Mr. Valon was charged with taking advantage of his position to make experiments at the cost of the town. All these matters were thoroughly investigated by Mr. Newbigging; and in due course he presented his report. In it he fully set forth all the facts relating to the two undertakings as he found them after scrutiny; but it will perhaps suffice to give here the concluding paragraphs:

It is not improbable that a larger balance of yearly profit might be secured for a few years by adopting a policy of starving the works and paying a lower price for management in the meantime. Men who can take off their coat and "do their bit" are not to be despised; but it is a short-sighted policy to expect a man having the responsible administration of important undertakings like the Ramsgate Gas and Water Works to take off his coat and bury his head either in a retort or in a trench. It is well that the responsible manager should keep his head above his shoulders, that he may be enabled to take a broad oversight of what is transpiring around him. The general conclusion to which I have come, after close observation and dispassionately viewing all the circumstances, is that the works, both gas and water, are managed with skill and resource, and with such economy as is compatible with maintaining them in a thoroughly efficient state. This is evident by the pecuniary results of the working, by the condition of the buildings, plant, apparatus, and mains, and by the cleanliness and order that are everywhere apparent in the departments.

The report was presented at a recent meeting of the Town Council, and was read by the Town Clerk (Mr. W. A. Hubbard). Its adoption having been moved by Mr. Hewitt, Mr. Gwyn said he was sure the report was most gratifying, and one that would strengthen the hands of the Engineer and those who had always supported the present management of the works. It confirmed in every detail what they had always said concerning it. It was significant that, though the burgesses were invited to attend the meeting, only two of them responded. They would now be satisfied that they had a prosperous commercial undertaking. Mr. Green said the reason people did not attend the inquiry was that they regarded it as incomplete. He had no wish to find fault with the report, for it simply told them what they already knew. Mr. Hammond endorsed all that had been said by Mr. Gwyn. They had, he said, every reason, after hearing the report by so eminent a man as Mr. Newbigging, to congratulate themselves on having works in so perfect a state, and on having a man like Mr. Valon who was so fully competent to carry them on. He thought it would be only fair to Mr. Valon and the other officers against whom the charges had been made to have the report printed and circulated. He therefore moved that it be printed as an advertisement in the local papers, and sent to every burgess in the town. Mr. Barnett seconded the motion. Mr. Hewitt said he too wanted to second it. He claimed that Mr. Newbigging had not made any answer to his charge—which he still maintained, and was prepared to prove—that the profits were "artificially inflated." He would do all he could to circulate the report; and he would give his answer in October. Mr. Richford thought it probable that members on the other side would get their answer in November. They asked for an inquiry; and he could quite understand that the report did not satisfy them. They had dug a pit, and had fallen into it themselves; and they would find that the ratepayers had not lost confidence in Mr. Valon, but in Mr. Barnett. Mr. Poole characterized the demands for an inquiry as mere antagonism to the eminent man at the head of the gas and water works—as a method adopted for the purpose of removing him from his position. The result of the inquiry, complete and thorough as it had been, established Mr. Valon's position more strongly than it had ever been before. The Mayor (Mr. Alderman Blackburn) cordially endorsed these remarks; and in the end the motion to print and circulate the report was unanimously adopted.

## STOCKPORT CORPORATION GAS SUPPLY.

**Annual Accounts—Proposed Reduction in Price.**

At the last Meeting of the Stockport Town Council—the MAYOR (Mr. J. Turner) presiding—the annual accounts of the Gas Committee were submitted; and, in the course of the discussion, as mentioned in last week's issue, a proposal was made to reduce the price of gas both inside and outside the borough.

Mr. J. NODEN, Chairman of the Gas Committee, in moving the adoption of the minutes, said that the accounts for the year ended March 31, after payment of £6525 interest on capital, and £4268 depreciation, showed a net profit of £5678. The total expenditure was £3180 less than in the previous year. The receipts from all sources were £73,244, as against £74,379, or a reduction of £1134. There was a decrease of no less a sum than £3972 in the receipts from the sale of residuals. The lessened expenditure for the year was £3180; and the reduced income was £1134 4s. 3d. Notwithstanding this, the increase on the profits of the past year was £2046.

The motion having been seconded,

Mr. G. BURROWS, in the course of a lengthy speech, contended that the gas-works were not in a very prosperous or satisfactory position, seeing that the profits were only 3¼ per cent. However, he intended moving that the price of gas be reduced.

The MAYOR: Do you not think that it is rather inopportune to propose a reduction in the price of gas in the present coal difficulty?

Mr. BURROWS: But our contracts have all been entered into.

The TOWN CLERK: The contracts are inoperative during strikes.

Mr. BURROWS persisted in his intention, and moved—"That in consequence of the reduction in the price of coal and cannel, amounting to a saving to this Corporation of upwards of £5000 on the prices of last year, and the gradual increase in the price of residuals and the improved methods of producing gas, the price of gas be reduced from the 29th of September to 2s. 6d. per 1000 cubic feet in the borough and 3s. per 1000 cubic feet outside the borough."

Mr. NEWTON seconded the proposition.

A question arose as to whether the motion was in order, and, so as to remove any difficulty, the resolution was altered to the effect that the Committee be recommended to reduce the price of gas.

Mr. HIDDERLEY remarked that he had always recommended the Council to see that the ratepayers obtained a fair return for their capital; and 3¼ per cent, which was what Mr. Burrows said the gas-works paid, was not a fair return. The reduction in the price of gas would be a great boon to large consumers; but ordinary consumers would have to make up the money in additional rates, and so it would not benefit them.

Alderman LEES considered the amount of profit reported was a mere nominal fee for such an establishment as the gas-works; and to talk of reducing the price of gas in the face of the interest for the past year being 3¼ per cent., would be very unwise. The least profit the Committee ought to realize was 5 per cent. Last year they paid for public lighting £70 more than was returned as the profits of the Gas Committee for the twelve months.

Two or three members having attributed the falling off in the number of consumers to the "bad quality" of the gas and the cheapness of oil, the motion was put to the vote, and rejected by a large majority.

Mr. NODEN, replying on the discussion, said the average capital of the gas undertaking during the nine years ending March 31, 1884, was £131,962 for an average sale of 228,427,000 cubic feet of gas, or equal to 11s. 6¼d. of capital per 1000 cubic feet. From that year to March, 1892, the taverage capital amounted to £141,197 for an average sale of 361,714,000 cubic feet of gas, or equal to 7s. 9¼d. of capital per 1000 feet. The amount of capital at the end of March, 1893, was £169,538, and the gas sold was 446,735,000 cubic feet, or equal to 7s. 7d. of capital per 1000 feet. In the case of the three London Gas Companies, the average capital per 1000 cubic feet of gas sold was 11s. 4d. The capital of the Birmingham Gas-Works per 1000 cubic feet was 11s. 11d.; Bolton, 16s.; Leeds, 10s. 9d.; Leicester, 14s. 3d.; Manchester, 9s.; Nottingham, 13s. 10d.; Oldham, 10s. 8d.; Salford, 12s. 8d.—the average of these towns being 11s. 7d., against 7s. 7d. for Stockport. For the nine and a half years ending 1884, the increase in the consumption of gas was 120,000,000 cubic feet, or equal to 12,973,000 feet per year; for the eight years ending 1892, 170,000,000 feet, or 21,302,000 feet per year—the average for the 18½ years being 16,927,211 feet. Coming to last year, the increase in the make of gas was 18,500,000 feet, or an increase for the last year of upwards of 1,500,000 feet over the average for the 18½ years. This did not suggest that the gas undertaking was "going to the dogs." The average price of gas in Great Britain (604 companies) was 3s. 7d. per 1000 feet; and the illuminating power was 17·12 candles. In Lancashire there were 68 gas-works, 38 being owned by local authorities and 30 by private companies. The average price charged by the authorities was 2s. 10d. per 1000 feet, and the illuminating power was 18·57 candles; while with regard to the companies, the average price was 3s. 7d. per 1000 feet, and the illuminating power, 18·29 candles—these figures being against 2s. 8d. charged at Stockport, and an illuminating power of 19 candles. As to the complaints that had been received, the majority were frivolous; but they received the attention of the Committee and the Engineer. There were 2428 complaints last year; but in the year ending March, 1891, there were 2654. He believed the falling off of the users of gas was to a great extent caused by the fine weather experienced of late.

The minutes were then adopted.

## DUKINFIELD LOCAL BOARD GAS SUPPLY.

### Prepayment Meters—The Capital Account.

At the Meeting of the Dukinfield Local Board on Monday last week, lengthy discussions took place on a recommendation of the Gas Committee that a deputation should visit other towns to inquire as to the use of prepayment meters, and a resolution of the Finance Committee to the effect that £3000 be borrowed on gas-works capital account. With regard to the former of these questions, Mr. Kerfoot suggested that it would be a waste of time and of money to send a deputation on a roving commission of inquiry as to prepayment meters. They were surrounded by the gas-works of other towns, and could learn all they wanted to know in their immediate neighbourhood. In any case, they would never grow rich out of penny-in-the-slot meters; and they would probably get any information they required by sending a letter. The Chairman (Mr. Bassil) remarked that in Dukinfield they had very large plant, sufficient to supply with gas double the present population; and they thought the adoption of prepayment meters would encourage the sale of gas. Mr. Grime moved that the resolution be referred back to the Committee; and Mr. Kerfoot seconded this. Mr. Pickup thought the Manager would have gleaned sufficient information on the subject at the meeting of The Gas Institute. A deputation would learn more than they could get to know by letter. Mr. Wood said that, according to experiments made in Manchester, the penny-in-the-slot principle was not successful; but the Manchester people were hoping to make improvements, and Dukinfield could afford to adopt a waiting attitude until these improvements were effected. The resolution referring the matter back to the Committee was adopted. On the question of increasing the gas-works capital account, Mr. Grime moved the rejection of the resolution to borrow £3000. He said that only eighteen months ago they adopted a similar resolution, and increased the capital by £3000; and he was alarmed at the complacency with which they added to the local burdens. The more they borrowed, the more difficult would it be to manage the gas-works at a reasonable cost per 1000 cubic feet. It must be remembered that they now possessed the whole of the works which formerly supplied Dukinfield, Denton, and Haughton; and though the two latter places had now their own works, ever since the separation they in Dukinfield had been adding to the capital account. In 1886, it was £22,000; while to-day, if they added the £3000, it would be £33,000—an increase of £11,000, or equal to an addition of £2000 a year to the capital. For the present unsatisfactory state of affairs he thought there were only three alternatives. They would have to raise the price of gas, reduce the cost of production, or subsidize the gas-works out of the rates. They would have to put their foot down at some time; and why not at once? Mr. Kerfoot saw no reason why the price should not be raised; and he said he would certainly rather pay 1d. or 2d. more per 1000 cubic feet for gas, and know they were in a good financial position, than be working at a loss. Mr. Pratt defended the course proposed by the Gas and Finance Committees, on the ground that it was recommended by the Auditor; while Mr. Taylor expressed the opinion that the gas-works, managed as at present, would eventually pay very well. Mr. Grime's proposition was, in the end, carried by a considerable majority.

## THE KEIGHLEY TOWN COUNCIL AND GAS AND ELECTRIC LIGHTING.

At the Meeting of the Keighley Town Council last Tuesday, the Gas Committee brought forward a recommendation to apply to the Local Government Board for borrowing powers to the exetnt of £30,000 for gas-works purposes. It is proposed to expend £7500 in the provision of a new retort-house as early as possible. Alderman Brigg, in proposing the adoption of the recommendation, said the gas-works were originally constructed to turn out a million cubic feet of gas per day; and it was thought that this would suffice for a considerable number of years. Last winter, however, the plant was working at its full capacity; and there were no spare retorts available in case of accident or prolonged and thick fogs. The Committee felt that this was a responsibility they were not disposed to take any longer; and therefore they asked the Council to sanction the borrowing of the amount named, which would mean practically the doubling of the present works, and would make them capable of producing 2 million cubic feet of gas per day. Mr. Newton seconded the motion. Alderman Holmes asked if in their estimate the Committee had taken into consideration the debit balance of £18,000 owing to the bank on the gas-works account. Alderman Brigg assured the members that this had not escaped the notice of the Committee, though it was not advisable to give full details of it. Mr. Sellers inquired if it was not time something was done with regard to electric lighting, and suggested that it would be better to lay out £10,000 upon the gas-works, and apply the rest of the money to an electric lighting installation. Mr. Edmondson also spoke in favour of the electric light, though he supported the recommendation of the Gas Committee, as he did not think there would be any diminution in the consumption of gas. Alderman Brigg, in reply, said he hoped that before long the electric light would be provided by the Corporation. At the same time he felt confident, from the experience of the Gas Committee, that the Council had not lost by the delay which had taken place; and in all probability a better and cheaper system would be found than any extensively used yet. But whatever the future of electric lighting, the extension of the gas-works would be necessary, as the experience was that, though the electric light might be largely used, there was the same or even an increased consumption of gas. The recommendation of the Committee was then adopted.

## SOUTH METROPOLITAN GAS COMPANY.

### The Half-Yearly Accounts.

Accompanying the report of the Directors of the above Company for the half year ending June 30, 1893 (as given in the last number of the JOURNAL), were the usual statements of accounts, which will be presented at the meeting of shareholders to-morrow. As on previous occasions, we merely note the changes in those portions which are subject to but little alteration; reproducing the remainder in full.

Statements Nos. 1 and 2 show the amount of share and loan capital raised at the close of the past half year. The former stood at £2,110,000; the latter at £750,000—together, £2,860,000. This was an increase of £30,000, as compared with Dec. 31, 1892; this amount of "C" stock having been raised in the six months.

Statements Nos. 3, 4, and 5—the capital, revenue, and profit and loss accounts—are given in full on the next page.

Statements Nos. 6, 7, and 8 show the positions of the reserve, renewal, and insurance funds. The reserve fund stood at £46,278 18s. 11d., compared with £45,352 12s. 3d. on the 31st of December last—the difference consisting of interest on amount invested, £632 18s. 8d.; and fraction of dividend on "A" stock transferred from the net revenue account (less forfeitures, £206 12s.), £293 8s.; the renewal fund, at £11,788 3s. 10d.; and the insurance fund, at £13,384 13s. 3d.

Statements Nos. 9 to 11—furnishing particulars as to the manufacturing operations of the Company—and No. 12, the general balance-sheet, are given in full.

The accounts are signed by the Company's Auditors (Messrs. A. Footner, W. Westcott, and C. Mortimer). The certificate of the Official Auditor (Mr. H. G. Calcraft), which accompanies them, states that "forfeitures incurred during the half year, amounting to £206 12s., must be borne and paid exclusively by and out of the divisible profits of the Company, and by way of reduction of dividend."

**The Smethwick Local Board Gas Undertaking.**—The Local Government Board have authorized the Smethwick Local Board to raise £1000 for the purpose of extending their mains.

# ACCOUNTS OF THE SOUTH METROPOLITAN GAS COMPANY FOR THE HALF YEAR ENDED JUNE 30, 1893.

## No. 3.—CAPITAL ACCOUNT.

Dr. Cr.

| | £ s. d. | £ s. d. |
|---|---|---|
| To Expenditure to Dec. 31, 1892 | .. | 3,071,588 14 5 |
| Expenditure during half year to June 30, 1893, viz.— | | |
| New buildings and machinery in extension of works | 27,279 3 1 | |
| New and additional mains and services | 12,381 11 10 | |
| Do. meters | 8,915 13 8 | |
| Do. stoves | 9,620 11 6 | |
| | 58,197 0 1 | |
| *Cr.*—By sale of land, &c. | 6,350 0 0 | |
| | | 51,847 0 1 |
| Total expenditure | .. | 3,123,435 14 6 |
| Balance | .. | 152,981 5 6 |
| | | 3,276,417 0 0 |

| Description of Capital. | Certified to Dec. 31, 1892. | Received since that Date. | Total to June 30, 1893. |
|---|---|---|---|
| | £ s. d. | £ | £ s. d. |
| By A stock | 500,000 0 0 | .. | 500,000 0 0 |
| B stock | 1,350,000 0 0 | .. | 1,350,000 0 0 |
| C stock | 230,000 0 0 | 30,000 | 260,000 0 0 |
| Debenture stock, 5 per cent. | 750,000 0 0 | .. | 750,000 0 0 |
| | 2,830,000 0 0 | 30,000 | 2,860,000 0 0 |
| Premium capital | 373,217 0 0 | 43,200 | 416,417 0 0 |
| | 3,203,217 0 0 | 73,200 | |
| | | | 3,276,417 0 0 |

## No. 4.—REVENUE ACCOUNT.

| | | |
|---|---|---|
| To Manufacture of gas— | | |
| Coals into store, including cost of petroleum spirit for enriching. (See Account No. 9) | £196,949 18 3 | |
| Purification, including £5192 12s. 1d. for labour | 9,161 6 6 | |
| Salaries of Engineer, Superintendent, and Officers at works | 5,553 7 1 | |
| Wages (carbonizing) | 50,054 2 4 | |
| Repairs and maintenance of works and plant, including £28,081 12s. 2d. for labour, less £932 6s. 1d. received for old materials | 45,935 10 4 | |
| | | £307,654 4 6 |
| Profit sharing for 12 months to June 30, 1893 | | 8,394 19 0 |
| Distribution of gas— | | |
| Repair, maintenance, and renewal of mains and service pipes, including £7416 1s. 9d. for labour | £11,099 3 6 | |
| Salaries, &c., Officers and Rental Clerks | 9,483 8 1 | |
| Repair, &c., of meters (£948 9s. for labour) | 6,525 7 10 | |
| Repair, &c., of stoves, (£1776 9s. 11d. labour). | 2,677 19 0 | |
| | | 29,785 18 5 |
| Public lamps—lighting and repairing | | 6,352 8 3 |
| Rents, rates, and taxes | | 18,396 12 11 |
| Management— | | |
| Directors' allowance | £1,750 0 0 | |
| Salaries of Secretary, Accountant, and Clerks | 2,024 8 4 | |
| Collectors | 5,029 7 7 | |
| Stationery and printing | 1,285 18 9 | |
| General charges | 3,760 17 10 | |
| Company's Auditors | 112 10 0 | |
| | | 13,963 2 6 |
| Law charges | | 2,832 11 11 |
| Bad debts | | 1,580 1 2 |
| Pensions and officers and men's superannuation and sick funds | | 3,325 5 7 |
| Gas Referees and Official Auditor | | 277 17 11 |
| Expenses Board of Trade Inquiry, Photometric Standards (previously paid on this account, £434 13s. 1d.) | | 432 9 1 |
| Total expenditure | | £392,995 11 3 |
| Balance carried to net revenue account (No. 5). | | 158,050 10 11 |
| | | £551,046 2 2 |

| | | |
|---|---|---|
| By Sale of gas— | | |
| Lady Day, at 2s. 6d. per 1000 feet | £247,353 8 7 | |
| Midsummer, at 2s. 5d. per 1000 feet | 127,353 7 1 | |
| | £374,711 15 8 | |
| Public lighting and under contracts (see Statement No. 11). | 30,162 14 9 | |
| | | £404,874 10 5 |
| Meters in use, 86,875— | | |
| Company's meters at rent (72,229) | £8,139 11 3 | |
| Stoves at rent (21,600) | 4,852 5 9 | |
| | | 12,991 16 6 |
| Residual products— | | |
| Coke, less £12,934 18s. 1d. for labour, &c. | £88,208 7 9 | |
| Breeze, less £1875 12s. 7d. for labour, &c. | 1,561 7 9 | |
| Tar, less £324 6s. 1d. for labour, &c. | 17,247 3 2 | |
| Ammoniacal liquor, less £556 6s. 1d. for labour, &c. | 17,980 14 3 | |
| Sulphate, less £1594 9s. 6d. acid, labour, &c. | 6,292 10 11 | |
| | | 131,290 3 10 |
| Rents receivable | | 1,831 16 5 |
| Transfer fees | | 57 15 0 |
| Total receipts | | £551,046 2 2 |

## No. 5.—PROFIT AND LOSS (NET REVENUE) ACCOUNT.

| | | |
|---|---|---|
| Interest on temporary loan and deposits | | £1,223 4 6 |
| ,, debenture stock | | 18,750 0 0 |
| Balance applicable to dividend on the ordinary stock | | 143,619 10 7 |
| | | £163,592 15 1 |
| Balance from last account | | £140,423 7 9 |
| *Less*—Dividend for half year ended Dec. 31, 1892 | £134,700 0 0 | |
| Fraction of dividend on "A" stock to reserve fund | 500 0 0 | |
| | | 135,200 0 0 |
| | | £5,223 7 9 |
| Amount from revenue account (No. 4) | | 158,050 10 11 |
| Interest on Bankers' balances | | 318 16 5 |
| | | £163,592 15 1 |

## No. 9.—STATEMENT OF COALS.

| Description of Coal. | In Store, Dec. 31, 1892. | Received during the Half Year. | Carbonized during the Half Year. | Used during the Half Year. | In Store, June 30, 1893. |
|---|---|---|---|---|---|
| | Tons. | Tons. | Tons. | Tons. | Tons. |
| Newcastle coal | 64,006 | 317,713 | 343,445 | 380 | 37,894 |
| Cannel coal | 1,935 | 796 | 773* | — | 1,958 |
| | 65,941 | 318,509 | 344,218 | 380 | 39,852 |

## No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

| — | In Store, Dec. 31, 1892. | Made during Half Year. | Used in the Half Year. | Sold in the Half Year. | In Store, June 30, 1893. |
|---|---|---|---|---|---|
| Coke—cwt.† | 199,738 | 4,263,691 | 910,470 | 3,403,040 | 148,919 |
| Breeze—yards | 5,606 | 62,350 | 11,236 | 55,531 | 1,189 |
| Tar—gallons | 377,725 | 3,813,675 | 11,700 | 3,217,294 | 462,406 |
| Ammoniacal liquor—butts. | 13,407 | 108,578 | 26,672 | 88,297 | 7,016 |

* 167,249 gallons of petroleum spirit used as a substitute for cannel.

† 1 cwt. of coke about equals 1 sack of 4 bushels, under Weights and Measures Act, 1878.

## No. 11.—STATEMENT OF GAS MADE, SOLD, ETC.

| Description of Gas. | Quantity made. | Quantity Sold. | | | Quantity used on Works, &c. | Total Quantity accounted for. | Quantity not accounted for. | Number of Public Lamps. |
|---|---|---|---|---|---|---|---|---|
| | | Public Lights (estimated). | Private Lights (per Meter). | Total Quantity Sold. | | | | |
| | Thousands. | Thousands. | Thousands. | Thousands. | Thousands. | Thousands. | Thousands. | |
| Common | 3,469,905 | 210,909 | 3,072,052 | 3,282,961 | 43,616 | 3,326,577 | 143,328 | 18,843 |

## No. 12.—BALANCE-SHEET.

| | | |
|---|---|---|
| To Capital— | | |
| Balance—per account No. 3 | | £153,981 5 6 |
| Reserve fund—per account No. 6 | | 46,278 18 11 |
| Renewal fund—per account No. 7 | | 11,788 3 10 |
| Insurance fund—per account No. 8 | | 13,384 13 3 |
| Net revenue account—for balance, per account No. 5 | | 143,619 10 7 |
| Debenture interest for amount due to June 30, 1893 | | 18,242 3 9 |
| Sundry tradesmen, for amount due for coals, stores, and sundries | | 41,782 9 11 |
| Deposits by consumers | | 27,393 17 0 |
| Dividend account (outstanding) | | 772 14 4 |
| Debenture account ,, | | 28 17 6 |
| Workmen's bonus and savings deposited with the Company | | 32,410 18 5 |
| | | £488,683 13 0 |
| By Cash at Bankers | | £114,028 3 8 |
| Amount invested— | | |
| Reserve fund | £43,367 15 8 | |
| Renewal fund | 11,783 2 9 | |
| Insurance fund | 12,715 6 3 | |
| | | 67,866 4 8 |
| Cash in hand for sundry payments | | 1,000 0 0 |
| Stores in hand— | | |
| Coals and enriching materials | £25,066 16 0 | |
| Coke and breeze | 4,092 13 5 | |
| Tar, sulphate, and ammoniacal liquor | 4,566 1 9 | |
| Sundry stores | 81,855 10 11 | |
| | | 115,581 2 1 |
| Investment of workmen's bonus, &c. | | 5,031 3 6 |
| Accounts due to the Company— | | |
| Gas meter and stove rental, quarter ending Midsummer, 1893 | £148,931 17 8 | |
| Arrears outstanding | 2,953 14 11 | |
| | | 151,885 12 7 |
| Coke and other residual products | | 26,423 19 8 |
| Sundries | | 6,867 6 10 |
| | | £488,683 13 0 |

## THE SHREWSBURY CORPORATION AND THE ELECTRIC LIGHTING COMPANY.

There was a long debate at a recent special meeting of the Shrewsbury Town Council on an application by the Electric Lighting Company for consent to their Provisional Order. According to the Order obtained by the Company in 1891, the Council have the right to acquire the undertaking at the expiration of seven years. It appears that the Company acquiesced in this term; but, in consequence of the limitation, the public have been loth to invest money in the concern. The discussion at the meeting was opened by Alderman Southam formally moving that the resolution of the Council, passed in March, 1891, in which the power was reserved to purchase the works at the end of seven years, should be rescinded. This was seconded; and then a report dealing generally with the subject of electric lighting, which had been drawn up by the Borough Surveyor, was read. He stated that there were only two out of the 73 cities or towns in Great Britain —viz., Brighton and Glasgow—which used water as the motive power for generating the light, and in the others steam was used. The charge for the light to the several consumers varied from 9d. to 4½d. per unit; and he calculated that the former price was equal to gas at 6s. per 1000 cubic feet, and the latter to gas at 3s. The average price might be taken at 7d. per unit, or equivalent to gas at 4s. 8d. He also referred to the expiration of the incandescent lamp patents next year, pointing out that the cost of fitting up houses would, in consequence, be considerably reduced; and, in conclusion, he strongly urged the Lighting Committee to seek an expert's opinion on the question. The first speaker in the discussion was Mr. Barker, who thought that the report showed that electricity was now a commercial success; and he protested against a monopoly being handed over to a company for 21 years. They had already been "pinched" by the Gas Company; and he believed the Corporation could supply the electric light much more economically and efficiently than a company. Alderman Lloyd, on the other hand, considered they should do all they could to encourage such an enterprise as the Electric Light Company. He also spoke of Mr. Barker's suggestion that large profits would be made as perfectly ridiculous and absurd; and said it appeared to him that the position taken up by that gentleman was very much like the dog in the manger. Alderman Herbert objected to the Corporation becoming a trading company; and three or four members argued that, in justice to the Electric Light Company, they ought to give them a longer period than seven years to run. With respect to the assertion that the Company would have a monopoly for 21 years, Mr. Lea (amid some laughter) said it should be remembered that the competition with the Gas Company would always prevent that. The motion was then carried. A further resolution was then proposed by Alderman Southam, consenting to the application of the Electric Light Company, but reserving power to the Council to purchase the undertaking at the end of 21, 28, or 35 years. There was a little opposition to this proposition; but several members having deprecated the spending of the ratepayers' money in speculation, it was also passed, with only three dissentients.

## THE SUPPLY OF ELECTRICITY BY MUNICIPALITIES.

At the recent Annual Meeting of the Incorporated Association of Municipal and County Engineers at West Bromwich, Mr. R. Hammond contributed a paper on "Municipal Electricity Works."

The author stated that, excluding from his calculations various small works which were being carried on under statutory powers, and the case of Brighton, which had an exceptional history, the total amount of capital invested in electricity works in the United Kingdom was: Companies, £4,083,654; local authorities, £474,000. In only two cases in which the gas-works belonged to the Corporation—those of Birmingham and Leeds—had the Local Authorities allowed Provisional Orders to go into the hands of companies. In the case of Leeds, power had been taken by the Corporation to purchase the works at any time on giving the Company sufficient Leeds Corporation stock to provide the shareholders with an income equal to a 5 per cent. dividend. At present contracts for the construction of 25 new electricity works had been given out. Four of these were for companies, and 21 for corporations; and in none of them was a company doing the work where the corporation had their own gas-works. The amount of work of this kind the companies had in hand; bore an insignificant proportion to that undertaken by corporations; the capital to be invested being: Companies, £82,406; local authorities, £766,474. Added to the former figures, this made the totals: Companies, £4,166,000; local authorities, £1,240,000. In 22 other places, work had been decided upon to the total amount of £807,000; and in each case the local authority had undertaken it. These brought the total up to: Companies, £4,166,000; local authorities, £2,000,000. Schemes for companies representing a total capital of £125,000 were being discussed from places in which the gas-works were owned by companies, but none from places where the corporation had those works. These figures were significant. They indicated, first, that there was a consensus of opinion in favour of electricity supply works; secondly, that there was an increasing tendency for the works to be undertaken by local authorities; and, thirdly, that in only two instances, representing capital to the amount of £125,000, of local authorities owning gas-works, had companies been granted Provisional Orders. The supply of gas and water by municipalities was justified on the grounds that the demand was practically useful, and that rich and poor alike were supplied without distinction of price. On exactly the same grounds, the supply of electrical energy by local authorities was desirable. A company took care to secure as its compulsory area the most profitable part of the town; and the persons outside that area were prejudiced by the lack of the advantages of electric lighting and power. A company, having regard to their dividends, would not be too ready to extend their area; but a local authority would be in a different position. The ratepayers could justly demand that the advantages provided at their risk, should be shared by all of them; and the question of dividends and directors' fees would not arise. The place occupied by the residuals in the economy of gas supply would probably in time be taken in regard to electricity supply by the employment of electrical energy in the daytime for mechanical purposes. This extra use would represent no additional capital outlay, as the plant used at night for lighting would be sufficient for producing power by day. He believed that, under such conditions, electrical energy might be supplied without risk to the ratepayers at a charge of 2d. per unit, which was equivalent to a charge of 1s. per 1000 cubic feet for gas. Having pointed to the superiority, as he maintained, of electricity in such matters as cleanliness, safety, health, and convenient distribution, Mr. Hammond concluded by remarking that he hoped he had said sufficient to persuade his hearers that electricity supply works ought to be established by every municipality in England.

In the discussion following the paper, the President (Mr. J. T. Eayrs) acknowledged that Mr. Hammond had brought forward strong evidence of the commercial success of public electric supply; but the members of the Association were obliged to exercise caution in advising the commencement of great undertakings. Mr. Cartwright agreed with Mr. Hammond that, where a public electric supply was established, it ought to be available for the entire municipal area. Mr. Boulnois took exception to Mr. Hammond's claim that electricity stood on the same footing as water with regard to the municipal authority undertaking the supply. He said there was no possibility of water being superseded as an article of universal use; but it was quite conceivable that electricity might be in time. They ought to be careful how they extended municipal trading, or eventually they would have municipal bakeries and grocers' shops, and municipal establishments for the sale of beer and spirits. He admitted that electricity was superior to gas for indoor lighting; but he did not know that for street lighting it was so good as gas. In a paper read by Mr. Trotter at the Institution of Civil Engineers, it was conclusively proved that the lighting of Whitehall by gas was a far greater success than the lighting of Queen Victoria Street by electricity. This should cause municipal engineers to pause before recommending their authorities to embark in any scheme of electric street lighting. Mr. Hammond, in reply, admitted, that there was a great deal in what Mr. Boulnois had said with regard to street lighting; and he himself would not advise any authority to be in a hurry in adopting electricity for that purpose. But for indoors electricity furnished an absolutely perfect light; and he thought the idea of its being superseded was quite chimerical.

## THE BRITISH INSTITUTE OF PUBLIC HEALTH.

### Annual Congress in Edinburgh.

As already mentioned in our Scotch Correspondent's "Notes," the annual congress of the British Institute of Public Health was opened in the Old University, Edinburgh, on the 27th ult., under the presidency of Dr. H. D. Littlejohn, Medical Officer of Health for the city. The business was divided between three sections, devoted respectively to Preventive Medicine, Sanitary Engineering, and Chemistry and Climatology; and we purpose noticing the subjects of most interest to our readers which came before the two latter.

In the course of his Inaugural Address, the President gave an account of the water supply of Edinburgh; tracing it from the abolition of private wells, and the introduction of the Comiston Springs in 1676, by which its success as a residential city was much enhanced. All the available springs on the Pentland range had, he said, been taken possession of by the city. But these had failed to supply the wants of the inhabitants; and they had had to extend their operations to the Moorfoot watershed. The water there was undoubtedly somewhat peaty; but the Corporation had, by a system of filtration, been successful in reducing—he could not say it had been entirely remedied—this peaty colour. Dealing with the question of sewage, he said that the slop water of the Old Town had for 200 years made its way to the sea, and, in its course, converted a sandy waste land to the east of Edinburgh into one of the most fertile spots in the Lothians; and his hearers would be astonished to learn that a yearly sum of £40 per acre was obtained for it. The New Town had its sewage conveyed in iron pipes out to sea; and the most interesting problem of how to avoid the sewage being carried back by the returning tides had been settled. No nuisance was caused by the passage of this enormous volume of sewage from the New Town into the Firth of Forth; and so successfully had it been carried out to sea that, so far as they could make out, the fish supply had not in any way been injured, nor had the amenity of the foreshores been interfered with. The southern portion of the city had been treated in a similar manner in regard to the disposal of its sewage. Edinburgh had always prided itself upon the manner in which the solid refuse was dealt with by daily removal; thus preventing the necessity of ash-pits and ash-bins, which everywhere constituted so fruitful a source of annoyance and ill-health. But, as they could easily understand, as the water-carriage system was perfected by means of good drains and a comparatively abundant water supply, the manurial value of the refuse had gone on diminishing. In 1863, when he became Medical Officer of Edinburgh, they were able to get 4s. per ton for this refuse. But its present value was *nil;* and even when it was delivered free at the doors of the farmers in the neighbourhood, they would have none of it. The Corporation, therefore, had had to face the question of the destruction of refuse; and they were about to make the experiment of destructors, one of which had been erected. These questions of destructors and increased water supply to provide for the continuous growth of the population, owing to the advantages presented by Edinburgh as a residential and educational centre, were the only sanitary problems which were at present engaging the attention of the citizens. For Edinburgh to retain its reputation, an increased supply of water was necessary; and the Corporation were busy in endeavouring to discover the best available methods of taking possession of some of the tributaries of the Tweed, and conveying water from the watershed of the Tweed to the watershed of the Forth. Accordingly, in the next session of Parliament, the Lord Provost would be prosecuting, and he hoped successfully, a Bill for providing

Edinburgh with a still larger supply of water. Having dealt with other improvements which have been made in Edinburgh, the President concluded by saying there still remained two blots upon their civic life, which pressed hard on Edinburgh as a residential town—viz., the constant noise attendant on their street traffic, and the damage done to their lungs and their houses by the waste of fuel in the shape of smoke. As a sanitarian, he thought that to deal successfully with these constituted the most pressing sanitary problems of the future.

In the Sanitary Engineering Section, the President (Professor G. F. Armstrong), in his opening address, threw out a few suggestions in regard to some of the directions in which modern hygiene seemed to point as being those in which it was specially desirable the sanitarian should carry forward his investigation. What, for instance, was to be said about the disposal of sewage by irrigation upon land, and of land irrigation in general? Irrigation, like most other things, might be abused as well as used; and, if abused, it was undoubtedly capable of giving rise to many and serious sanitary evils. In order to minimize the risk of incurring the evils which were well known to attend its practice, the present state of our knowledge seemed to indicate the following precautions as being necessary: (1) The selection of suitable ground; (2) that, when sewage was used, it should be brought on the ground as fresh as possible; (3) that in all cases the flow should be so regulated as to prevent stagnation; and (4) that, where the subsoil was of a more or less retentive nature, or where the surface was too flat to admit of an easy flow, subsoil drainage must be added, with sufficient falls to facilitate filtration. Another question of great importance just now was whether or not they were justified in taking a water supply from a river that was in any way liable to contamination by town sewage. There, again, there was great diversity, not only of opinion, but apparently in the region of experience also. The whole question, it seemed, needed further and close investigation; but their present knowledge might be briefly summed up as follows: (1) That rivers did exert an enormous oxidizing power on dead organic matter; (2) that fully developed microbes could neither exist for any length of time nor multiply in running water, and that consequently they rapidly disappeared therefrom; (3) that the spores of these organisms had the power of preserving their vitality in running water, and might, therefore, become a source of danger to those who drank it, but that in most cases the volume of water in a river was so enormous, as compared with the number of organisms conceivably present, as to reduce to an unusually remote possibility the chance of a greater number of spores entering the system than it was naturally able to eliminate. Assuming these premises, they might draw the conclusion that the duty of the engineer was to take the supply at a point as remote as practicable from that at which contamination might occur; to break up the stream as much as possible, so as to subject the water to a maximum action of air and light; to make ample provision for settlement before filtration in time of flood; to design the filter-beds so as to ensure a slow, equable, and complete filtration; and to endeavour to discover some substance, innocuous to the human organism, but destructive alike to germ and spore, that might be added to the filter to ensure their extinction. Another question of great importance, especially in large towns, had reference to the mode of disposal of the general solid refuse. What might prove to be the future of these appliances, it was not, of course, possible to say with certainty; but all the evidence available seemed to point to their employment as effecting a noteworthy advance in municipal sanitation. Other subjects calling for attention were the establishment of a universal constant system of water distribution; the separate systems as applied to both sewage and water supply; and the relation of subsoil water and subsoil drainage to health.

In the Section of Chemistry and Climatology, the President of which was Professor Crum-Brown, the ordinary proceedings were opened by Mr. W. Ivison Macadam with a communication on the subject of analyses of domestic waters, and the interpretation of the results of these analyses. In the first place, he touched upon the question of the proportion of saline matter which water might hold, and still be quite fit for domestic use. In Scotland, he pointed out, chemists were of opinion that waters containing a considerable amount of this matter were most suitable for town supplies. While it was the case that water which did not contain any was used in some places without any trace being found of its being injurious to health, he thought the water for a town supply should be one containing a slight quantity, and should, as far as possible, be free—at least should not contain an excess—of carbonate of lime. While the presence of chlorine or chlorides was a valuable indication of impurity, too much credit should not be placed upon these. In his opinion, one of the best indications that could be obtained of the purity or impurity of water was not so much the proportion of dissolved gases in the water as the relative proportion that the oxygen and the nitrogen bore to one another; and it was only seldom that these relative proportions failed to give a reliable indication of the purity of the water. Summing up the views expressed in his communication, Mr. Macadam said he considered that the saline ingredients should be small in amount; that nitrates and nitrites should be absent; that chlorine should be low, except near the sea; that the dissolved gases should contain little carbonic acid gas, and that the oxygen and hydrogen should be in the proportion of one to two; that the saline and albuminoid ammonia should be low, but that, if the latter was high, care should be taken to see that the result was not due to harmless vegetable matter; and that the waters which acted most on lead were those containing carbonic acid derived from decomposition. Dr. T. G. Nasmyth, Medical Officer of Health for Fifeshire, also dealt with the subject of the analysis of water. He pointed out that at the present time local authorities were busy trying to secure that the first line of sanitary defence should be established. That line was a pure water supply; and, before incurring the expense of introducing it, they were naturally desirous of knowing if the water proposed to be used was pure. Dr. Nasmyth went on to examine the grounds taken up by the two classes of people—the one made up of those who held that chemists could not be trusted to give a reliable opinion in regard to water, and the other of those who took an entirely contrary view. He suggested several alterations in the usual practice of analysts, which, he thought, if given effect to, would lead to more certainty attaching to the value of chemical analyses in regard to water. He deprecated strongly a supply for domestic use being in any case taken from the shallow wells in near proximity to houses; and, summing up his paper, said that chemical analysts could tell the purity and fitness of a water for human use, but not its purity and safety.

The discussion on the two papers was opened by Sir C. A. Cameron (Dublin). He said that in one part of America the presence of chlorine was taken as a certain test of the impurity of water; and there all water which had any excess of chlorine was condemned. If, in Ireland, they were to condemn waters on this ground, all would be affected, for they all contained a larger or smaller amount of chlorine. In his opinion, albuminoid matter was really the ingredient to the presence of which the greatest importance ought to be attached, and comparatively little to the presence of chlorine. He quite agreed with the propriety of never using waters from shallow wells; and he further said that the upper part of deep wells also might contain impure water. As to the detection of organic impurity in water, he did not agree with the view that the biological methods were more reliable than the chemical methods, although he was quite aware that, in some cases of organic matter, the chemical analysis could not reveal its presence. Still, it was not the number of micro-organisms in water, but the character of them, that was of importance. The danger of using water which contained organic matter increased with the amount of that matter; and the more free water was from organic impurities, the more, of course, would it be free from the impurities that produced disease. Dr. A. P. Aitken (Edinburgh) said that, when sewage contamination existed, there were certain qualities in the water which indicated the fact. It would, he thought, be very useful if a systematic examination were made of the water in the various districts of the country; for any great variation from the normal character of the water in the district would be an indication of sewage contamination. He was not in favour of the water of shallow wells being employed for domestic use; but they must remember that in some cases it was the only available source. Dr. Kenyon (Chester) supported Sir Charles Cameron's opinion that chlorine, taken by itself, was hardly of any value as a sign of impurity in different parts of the country, because its presence did not necessarily mean contamination by sewage. Dr. Purves (Edinburgh) did not think chemical analysis of water could be abolished. At the same time, its biological examination should never be neglected.

On the second day of the congress, the Vice-President of the Chemistry Section (Professor Percy F. Frankland) read a paper entitled "The Bacteriological Examination of Water and the Information it has Furnished." The bacterial contents of various waters were first described; and attention was drawn to the comparative freedom from microbes of the best spring and deep-well waters; ordinary river water, on the other hand, containing generally from 1000 to 100,000 in about 25 drops. A list was given of the organisms associated with disease which have been found at various times in water, among which were the cholera and typhoid microbes, anthrax, the lock-jaw organism, and the tubercle bacillus. An account was furnished of the most recent methods employed for the successful detection of pathogenic bacteria in water when present together with numerous and harmless water forms. An interesting review was also given of the power of multiplication in water possessed by so many microbes; and it was pointed out that, in order to successfully investigate any given water for bacteria, as short an interval as possible must elapse between the collection of the sample and its examination. The author then gave a more particular description of the behaviour in this respect of disease organisms in water; and mention was made of the capability of many such forms living for long periods of time in various waters. Stress was laid upon the fact that, in ordinary unboiled water, their vitality is not so extended as in water which, by either boiling or filtration, has been deprived of the ordinary water microbes. The author then referred to his own experiments on anthrax in water recently made for the Royal Society (see *ante*, p. 120), and pointed out how strikingly this fact had been brought out in the case of this organism—that whereas, at the end of a period of seven months, the vitality and virulence of the anthrax bacillus were unimpaired in those waters deprived of their organisms, in the raw water it was not only in some cases actually destroyed in this time, but its virulence was invariably much diminished. This is probably due to the products elaborated by the native water microbes acting prejudicially on the foreign pathogenic forms introduced. The author's striking experiments on the effect of sunshine on the vitality of the anthrax bacillus in water were also referred to; and it was pointed out that, although the hardy spore form of this organism is well known to die off on potatoes and jelly and similar materials in the course of a few hours' sunshine, in water such spores were found capable of enduring and surviving as much as 100 hours' insolation. The hygienic importance of sand filtration in the removal of micro-organisms, shown for the first time in this country by the author in 1886, was dwelt upon. As a practical illustration of the importance attaching to this process of water purification, reference was made to the cholera epidemic which devastated Hamburg last year. This city derives its drinking water from the Elbe, and the inhabitants drink it unfiltered; while Altona, in its vicinity, uses also this river water, but first submits it to careful sand filtration. It was shown that the number of cases of cholera per 100,000 of the inhabitants in Altona was only about one-eighth of the number of the same population in Hamburg. In conclusion, Professor Percy Frankland pointed out that the enormous amount of labour which had already been bestowed on the bacteriology of water had brought forth an abundance of information of the greatest practical and hygienic importance, which was calculated to render us more competent to cope with those dreaded epidemics which continually menace us through contaminated drinking water, and which, as long as their cause and origin were invested with darkness and mystery, could not fail to excite widespread panic and alarm. The paper was illustrated with numerous lantern slides and demonstrations.

The paper gave rise to considerable discussion. Dr. Hunter Stewart (Edinburgh) said the final result of the filtration of the Edinburgh water, as compared with that obtained in London, was distinctly favourable to Edinburgh. At the same time, the initial bacterial condition of the Edinburgh water was very different from that of the

Thames water. Still, the result of the filtration of the former was such as to give some comfort to the citizens. Speaking broadly, there were from 80 to 100 micro-organisms in a cubic centimetre of Edinburgh water after filtration. The number, however, was sometimes very small indeed. On several occasions in winter, it had fallen to zero; and very often it was about 9 and 10 per half cubic centimetre of water, which was the quantity he was in the habit of examining. This year they had experienced a severe drought; and during its prevalence, he had examined the water. After filtration, it showed very little change from the normal, so far as the number of micro-organisms was concerned, although the bacilli in the water must have been increasing very considerably when the reservoirs were so low. Two days before the rain came, the micro-organisms were less than 150 per cubic centimetre; but the day on which the weather broke, they rose to 3700 per cubic centimetre in the filtered water. The following day the number was 2000; the next day, it was 1400; and the number gradually fell to the normal. Although he was a great believer in sand filtration, there they had a case where it was unable to cope with a condition of affairs suddenly arising. Dr. A. C. Houston said he also was in the habit of examining the Edinburgh water after filtration; and the results he obtained were the same as those given by Dr. Stewart. When the rain came after the recent drought, the number of micro-organisms rose enormously. At one particular time, they were so numerous that they could not be counted; and for several days after the rain came, there were thousands of them in a cubic centimetre. Professor Frankland, in reply, said that sand filtration was now being introduced in a number of places where the water was not filtered; and he had recently recommended its adoption in the case of Dundee, which, up to a short time ago, was regarded as having an unimpeachable source of water supply. Edinburgh was provided with a very soft water; and figures showed that it was exceedingly well filtered. He thought in filtration the water to be filtered should be introduced below the bed of sand, and allowed to rise through it. In the case of Dundee, the loch from which the water supply was derived had become gradually lower during the drought; and still the number of micro-organisms in the water supplied to the town had been remarkably small. It had frequently been contended, by those of the German school of bacteriologists who had examined into the matter, that sand filters working properly arrested the progress of all the micro-organisms in the water. He had always held that this was not the case—that, even after sand filtration, the water would contain a certain number of bacilli. In fact, the number of micro-organisms remaining in the filtered water would be just in proportion to the number which were in the water before its filtration. For general purposes, the chemical analysis of water was far more important than its bacteriological examination.

Notice of other papers which came before the congress, whose labours closed on the 31st ult., must be held over.

## PLYMOUTH CORPORATION WATER SUPPLY.

### An Old Custom—The New Works.

The quaint annual ceremony known as "Ye Fyshinge Feast," by which the Mayor and Corporation of Plymouth keep in grateful recollection the memory of Sir Francis Drake, the founder of its water supply, was held last Wednesday; and the occasion was invested with unusual interest by the performance of a double function marking a new epoch in the history of the Plymouth water question—the blasting of the first charge in the excavating of the trench for the foundation of the Burrator dam, which will impound a storeage reservoir on the moors, and the cutting of the first sod in connection with the laying of the line of pipes to carry the water from Burrator to the Roborough reservoir. Some 40 carriages were required to convey to the moors the large company invited to be present at the ceremonies. The party first proceeded to a point of the leat near the centre of the Clearbrook Bend, where the first sod for the new line of pipes was cut by Mr. J. T. Bond, the Chairman of the Water Committee. When completed the pipes will extend almost in a straight line from Burrator to Roborough—a distance of 4½ miles. Before commencing the task, Mr. Bond was presented by the Mayor (Mr. W. Law), on behalf of the Committee, with a handsome silver-plated spade, with an oak handle. After another hour's pleasant drive across the moors, the company reached the picturesque valley of the Meavy, and, alighting near Sheepstor Bridge, walked to the Head Weir, where the time-honoured ceremony already referred to took place. From a goblet of pure water taken from the weir the Mayor drank "to the pious memory of Sir Francis Drake;" and the cup was passed on to the rest of the party, who each drank from it, repeating the same words. Another goblet filled with wine was then presented by the Borough Chamberlain to the Mayor, and circulated as before, each drinking to the toast, "May the descendants of him who brought us water never want wine." After partaking of luncheon in a tent near the Weir, and close to the dam at Burrator, the first charges in the blasting operations were fired by the Mayor and Chairman of the Water Committee. When erected the dam will extend right across the valley. It will be 70 feet wide at the bottom and 22 feet at the top; and its height will be 88 feet. As a momento of the occasion, Mr. Bond, in the name of the Water Committee, presented the Mayor with a silver model of a quarryman's jumper. On returning from Burrator, the day's proceedings were, as customary, wound up by a dinner, which was served in a large marquee at the Head Weir; a considerable number of guests being present.

**Huddersfield Electricity Supply Works.**—The electric lighting works of the Hnddersfield Corporation (some particulars of which have been given in our columns) were started on the 29th ult. There are already 83 consumers, taking a supply equal to 9000 8-candle power lamps. With regard to the cost of the works, the contracts entered into totalled to £29,693, including one with the Brush Electric Lighting Company for plant amounting to £20,640.

## NOTES FROM SCOTLAND.

**From Our Own Correspondent.**

*Saturday.*

Though outside my district, I suppose that in these times, when advances are the order of the day in gas-works appliances, you will be able to find space for the following account of an improved setting, adapted for gas-firing, which I recently had the opportunity, of inspecting, through the courtesy of Mr. Joseph Hepworth, the Engineer and Manager of the Carlisle Corporation Gas-Works. These settings have been adapted to existing arches. The small amount of excavation necessary for the generators and cellar on one side only of a through bench of retorts, makes it unnecessary to underpin the walls; and thus obviates the risk in going below the foundations of the arches. The generator is one introduced by Mr. Glover, the Assistant Engineer in the Carlisle works, who pointed out the ease with which the clinker and ashes were removed, by reason of the inclined bars. The construction throughout is simple and strong; while the efficiency is best understood by the work actually being done. One generator is heating two settings of retorts 20 feet through, carbonizing 18 tons of coal per day. The fuel account compares favourably with that of some of the more costly regenerative settings. A further installation of six through settings, heated by three generators, has just been commenced. Mr. Hepworth has recommended this system of heating retorts to several small works, where the fuel account and make per mouthpiece are at present unsatisfactory. The low first cost for introduction now brings the advantages of gas-firing within the reach of any works.

It is satisfactory to note that in Dundee, notwithstanding that electricity is now a rival of gas lighting, the output of gas from the Corporation works continues to increase. In the month of June, there was a large increase; and again last month there was an advance in the quantity of gas consumed, amounting to nearly a million cubic feet. The actual figures were 15,953,000 cubic feet, as compared with 15,026,000 cubic feet in July of last year.

An instructive comparison may be instituted of the comparative cost of the lighting of public thoroughfares by gas and electricity, from figures which have been published with reference to the charges that have been made in Dundee. From the 1st to the 31st of July 41,068 cubic feet of gas were consumed in the town lamps, which, at 3s. 2d. per 1000 cubic feet, cost £64 18s. From the 1st of June to the 31st of July, 602 Board of Trade units of electricity were supplied to the four arc lamps in the High Street, which, at 5d. per unit, gave an expenditure of £12 10s. 10d.—the total account for the public illumination of the city being £77 8s. 10d. These four electric lamps light about half a mile of thoroughfare; and they cost one-tenth of what it does to light the many remaining miles of city thoroughfares by gas. It has also to be borne in mind that the charge for electricity in Dundee is fixed at so low a figure that the Corporation do not expect it to cover the cost of production.

It is reported that an explosion of gas of a rather violent nature occurred in the works of the Ruchill Chemical Company, Glasgow, on Monday night. The narrative is that a metal condenser, 8 feet long by 12 feet broad and 12 inches deep, used for refining gas tar, and which is connected by a hydraulic pipe 40 feet long with the retorts in the building, had been standing empty since Saturday. Gas is supposed to have accumulated in the condenser, as, on the fireman going to charge it, the explosion took place, wrecking the condenser and throwing large pieces of the metal into the air to a height of 40 feet. It is supposed the explosion was caused by a tongue of flame passing through the hydraulic pipe, as it is cracked from end to end. The incident shows the care with which works where gaseous products are dealt with should be handled after they have been out of use for some time.

The Aberdeen Town Council on Monday, out of a list of 65 applicants for the post of electrical engineer to the Corporation, elected Mr. E. T. Ruthven Murray, electrical engineer, of Larne. The salary is £250. The Gas Committee have fixed the charge for electrical energy at 7d. per unit.

An important addition to the coal supply of Lanarkshire has just been made by the completion of a new shaft which Messrs. Colin Dunlop and Co. have sunk at Hamilton. The shaft pierces the ell seam, 3 feet in thickness, the main seam, 4½ feet, and reaches to the splint, which is 5 ft. 8 in. thick, and is found at a depth of 106 fathoms. The new shaft will enable another thousand tons a day to be raised by the firm.

During the past year the consumption of water in Paisley amounted to 1,734,245,090 gallons, which was equal to 35 gallons per head of the population per day. The domestic water-rate has been continued at 8d. per pound; and the public rate, at 1d. per pound. The revenue for the current year is estimated at £24,000; and the expenditure, including £12,060 of interest, at £22,359, which would, if realized, leave a surplus of £1641.

The yearly statement of accounts of the Falkirk and Larbert Water Trustees, shows that the Trustees have borrowed £78,387, and that their capital expenditure up to the present time has been £73,445. Last year the revenue from domestic rates amounted to £4205; and from special rates, to £869. Interest on borrowed money entailed a cost of £2741; maintenance, £850; management, £1210; and sinking fund, £603—leaving a balance on the year's working of £1375.

**Fatal Gas Explosion at Dover.**—On the 1st inst., an inquiry was held at Dover into the circumstances attending the death of a carpenter named Kemp, who was killed by an explosion which took place recently at the local branch of the National Provincial Bank. On the day of the accident, a smell of gas was perceived; and it was while search was being made for the escape that the explosion occurred. The premises were much damaged; and Kemp was found among the *débris*. Evidence was given by a Mr. Stift to the effect that the gas-fittings were of the old ball-socket type, and that there had apparently been an escape from them. The jury returned a verdict that the man met his death by an explosion of gas; but they were not prepared to say how this was caused.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 12.

**Sulphate of Ammonia.**—Prices keep creeping up; and the extreme figure mentioned in last week's report has been actually touched at all the ports. Such is the scarcity of spot and near parcels, that it is difficult to foretell at present where and when the advance will end. A quotation of £14 would in the early part of the year have sounded chimerical; to-day it has not even produced a state of undue excitement, which might have been anticipated from the present condition of things. The last time £14 was paid was in 1884; and the great fall then (values were £19 at the beginning of 1883) was as much a surprise as the rise is now. It was over-production in the former case; it is under-production now. Nitrate is moving in quite a different direction. The ordinary quality has declined to 9s. 4½d. on spot.

LONDON, *Aug.* 12.

**Tar Products.**—This market is in a deplorable condition. Scarcely any business is being done; and prices continue to go from bad to worse. Tar acids, which have been the mainstay of tar distillers for a year or more, are now difficult to sell, even at the low prices to which they have fallen. Fortunately the production is low; but considerable stocks are being carried by makers who are naturally anxious to get them out of the way before the new season's productions come on. The outlook for all tar products is distinctly gloomy; and it is hard to see where the demand can come from to overtake stocks, and the increased production which will shortly take place. Prices nominally are: Tar, 12s. 6d. Pitch, 23s. to 24s. Benzols, 90's and 50's, 1s. 4½d. Solvent naphtha, 1s. 1d. Toluol, 1s. 4d. Crude benzol naphtha, 30 per cent., 6¾d. Creosote, 1d. Creosote salts, 15s. Carbolic acid, 60's, 1s. 6d.; crystals, 6½d. Cresol, 1s. 6d. Anthracene, nominal, 30 per cent., "A," 1s.; "B," 8½d.

**Sulphate of Ammonia** continues to boom; and, as has been prognosticated for some time in these columns, the price has at last reached £14 per ton, less 3½ per cent. Undoubtedly there are numerous buyers for forward delivery at £12s. 15s. to £13 per ton, which is a most hopeful sign, and looks as if the stuff is wanted for consumption, although rumours are rife that the market is entirely in the hands of the "bulls." There are no stocks in this country; and the large stocks which usually exist at Continental ports have also disappeared during the last three months. Gas liquor is valued at 9s. 6d. to 10s. 6d.

## COAL TRADE REPORTS.

**From Our Own Correspondents.**

**Lancashire Coal Trade.**—The position generally throughout the coal trade of this district remains practically unchanged, neither side at present showing a disposition to suggest any compromise which might lead to a resumption of work at the pits; and in the meantime requirements of consumers are being supplied out of the stocks held at the collieries. Business, taking it all through, has been very quiet during the past week, the demand for the better qualities of round coal having been exceptionally small; whilst there has also been a lull as regards other descriptions of fuel for steam, forge, and general manufacturing purposes. The result is that the filling up out of stocks has fallen off considerably; and at a number of the collieries the sidings are at present full of waggons loaded up with coal, which is not at all finding a ready sale at the advanced prices that are being quoted. Generally it may be said that colliery proprietors who have been endeavouring to get what may be termed "fancy" prices for their coal, have found that these have not been obtainable; and to effect sales, they have had to come down to some more reasonable advance upon the rates ruling prior to the stoppage of the pits. The full extent of the advance that has actually been got can scarcely be said to exceed 5s. per ton in West Lancashire districts; and in the Manchester district, it ranges from 3s. 4d. up to 4s. per ton. As a good many collieries are only supplying through-and-through coal out of their stocks, whilst others are still screening with the view of obtaining slack for engine purposes, which is exceedingly scarce, prices can only be given relatively at about 14s. to 15s. for best coals; 12s. to 13s. for through-and-through and common coal; and from 10s. up to 11s. per ton for engine fuel, at the pit mouth. In the shipping trade, there has been little doing, as vessels have been able to go round to other ports and obtain supplies from districts where collieries are still working.

**Northern Coal Trade.**—There has been an increased production in the coal trade of the North-eastern district; and the enlarged output has been well taken up—merchants who have old contracts at low prices being anxious to obtain delivery, in some instances for resale at an advanced price. There is now very full work at all the collieries; and in a few cases more men have been employed. Shipments of coal are about as large as a year ago, when the losses made by the previous strike had to be made up; and there is a considerable quantity of coal being sent into Yorkshire from pits in South Durham, so that the demand is steady. Best steam coal from Northumberland is being largely delivered on old contracts, and a few sales have been made at prices as high as 12s. per ton f.o.b.; but these are exceptional cases, for very prompt delivery. Second-class steam coal is similarly situated; small quantities having been sold at 10s. 6d. per ton f.o.b. Small steam coals are rather quieter, the output being now very large; and the price is from 5s. to 5s. 6d. per ton Manufacturing coals are steady, and the demand from other centres is large; but higher prices are not readily paid. Gas coals are being freely produced, the output of the great collieries of Durham being well maintained; whilst the gas companies are generally taking considerable deliveries, and maintaining their stocks. Prices for quantities that have not been contracted for are higher; but it is difficult to give actual rates, though sales of small lots are believed to have been made at as high as 8s. per ton f.o.b., for best Durham gas coals. There is no alteration in the proportion that the prices of other kinds bear to the best. Coke is firm, and the demand from the inland furnaces has increased; whilst the price quoted for shipment must be now put as fully 16s. per ton. For home use, best Durham coke is quoted 13s. 6d. per ton at the furnaces in Cleveland. There is no change in the price of gas coke; but the production is being enlarged now, and in one or two works stocks are heavier than they were.

**Scotch Coal Trade.**—While it is true that coalmasters in Scotland have benefited, and are continuing to benefit, by the strike of miners in England, it is also the fact that there is much uncertainty and hesitation among them as to the future. The men are naturally making the most of the rise in the price of coal which has followed the demand from England; and, what is also natural, they are inclined to ask for a larger advance in wages than the masters think is warranted. If the men could be relied on to work, the masters could take on forward orders; and they could then afford all that the men are asking, which is, speaking generally, an advance of 1s. per day. But, in the uncertainty which hangs over the men's actions, forward contracting is risky; and consequently, as it is mostly hand-to-mouth orders from England which are being fulfilled, and as whenever the strike there ends there will be a fall in prices, a large advance would mean then a loss to the masters. The Lothians and Fife masters this week refused to advance their men's wages—the former because they did not impose the last reduction, and the latter because they are heavily contracted forward at very low rates. In the West of Scotland, the masters on Wednesday resolved to give an advance of 6d. per day. On the same day, the men met in conference in Glasgow; and, putting on a bold front, they resolved, by a large majority, to strike unless 1s. were granted. Since that decision was come to by the men, some of the employers have "sliddered down" and conceded the 1s., upon condition that the men work five days a week, instead of the four days which has been the rule for the past three months. This will have the effect of breaking up the men, and altogether the situation is a very complicated one. The prices quoted are: Main, 8s. 6d. to 9s.; ell, 9s. to 9s. 6d.; splint, 9s. to 9s. 6d.; and steam, 9s. per ton f.o.b. Glasgow. The shipments during the week were considerably up, amounting to 168,617 tons—an increase of 27,753 tons over the preceding week, and of 10,281 tons as compared with the corresponding week of last year. The increase was chiefly at the east coast ports, which are particularly busy. For the year to date, the total shipments have been 4,007,474 tons—a decrease as compared with the same period of 1892 of 380,102 tons.

**The Bilston Improvement Commissioners and the Water Supply of their District.**—The litigation which has been going on for some time between the Bilston Improvement Commissioners and the Wolverhampton Corporation, as to the construction of an agreement under which the Corporation contended that the Commissioners were bound to take all their water from them, has now terminated. The case came before Mr. Justice North, who, in December, 1890, decided in favour of the Corporation. Against this decision the Commissioners appealed; but they were again unsuccessful, although one member of the Court (Mr. Justice Kay) disagreed with the other learned Judges. They subsequently lodged an appeal to the House of Lords; but this has now been withdrawn.

**Proposed Transfer of the Gomersal Water-Works to the Local Board.**—The Gomersal Local Board yesterday week had under consideration a letter from the Gomersal Water Company (in reply to an inquiry they had made), saying that the Directors were willing to recommend the shareholders to sell their plant and interest in the concern for £10,000, all sums due to, and owing by, the Company on Dec. 31, 1893, to be received and paid by them, and the completion of the transfer to take place on the following day. After some little discussion, it was decided that a Committee be formed, consisting of all the members of the Board, excepting those who are shareholders in the Company; and that the Committee approach the Directors and report the result at the next meeting of the Board.

**The "Lancet" and Lead-Poisoning.**—Referring to a recent suggestion in the *Lancet* that the voltage between gas and water pipes may produce electrolytic effects whereby traces of lead might find their way, in solution, to the water, the New York *Electrical World* points out that in the first place, the lead is not "dissolved" by such an electrolytic action, unless the earth contains a *solvent* of lead, in which case the dissolution would occur even if there were no current. In the second place, this current passes from one pipe to the other through the earth, and therefore affects only the external and not the internal surface of the pipes, except, possibly, to a very slight degree, through high resistance water circuits of small cross section, back through the reservoir and the pumps to the ground—the water in the pipes being connected directly to the earth only in the case of leakage. Lastly, they point out that the electrolytic action between iron and lead, in an electrolyte, is to oxidize the iron, and not the lead—the latter being reduced—which renders it all the more insoluble.

**Pollution of the Rotherham Corporation Water Supply.**—Last Tuesday, Colonel J. Ord Hasted, R.E., one of the Inspectors of the Local Government Board, held inquiries at Dalton and Ulley relative to applications made by the Rotherham Rural Sanitary Authority for sanction to borrow the sums of £280 and £400 for the purpose of sewage works in the districts named. The proceedings were of an important character, inasmuch as the inquiries had reference to projects which the Authority concerned are desirous of carrying out, with the object of preventing pollution of the Rotherham water supply. Some time ago Dr. Theodore Thomson, the Medical Inspector of the Local Government Board, visited Rotherham and investigated the various sources of water supply to the town; and, in the report which he subsequently presented to the Board, he condemned the supply, and pointed out several places where contamination occurred. These were in districts which were under the control of the Rural Sanitary Authority. By the drainage schemes suggested, it was proposed to remedy any defects that might exist; but the Rotherham Corporation strongly opposed, on the ground that they are incomplete and inadequate. The Corporation had pressed the Sanitary Authority to remedy the matters complained of; and, if complete and final schemes were put forward, they offered to pay a substantial portion of the costs. Witnesses in support of the application admitted the liability to pollution of the streams, even if the Sanitary Authority's proposals were adopted.

**The Acquisition of the Neath Water-Works by the Corporation.**—The Neath Town Council last Friday week held a private meeting to consider the question of the purchase of the water-works, reference to which was made in our issue for the 4th ult. The negotiations, it appears, have resulted in an offer by the Water Company to sell their undertaking for £46,034 (of which £37,070 is to be paid in cash on completion, the remaining £8964 representing debenture stock and bonds to be taken over by the Corporation). A resolution was passed, accepting this offer, subject to a satisfactory agreement being made by the Corporation with the owners of the Gnoll estate as to the filter-beds and land for increased storeage; the undertaking to be transferred as from the date of the Royal Assent being given to the Bill about to be promoted in Parliament authorizing the purchase. The Company are to assist the Corporation in obtaining for the ratepayers £785 1s. 8d. in Consols deposited in Court under section 9 of the Company's Act of 1885. The Corporation further intimate that, while it is highly probable the services of the present Manager will be retained, they deem it inexpedient to pledge themselves as to the appointment of any officer until the undertaking is actually owned by them.

**The Water Supply of Worthing.**—The inquiry into the question of a new water supply for Worthing, which the Local Government Board have specially expedited in view of the serious condition of affairs in that town, to which reference has been made, was held by Mr. Arnold Taylor in the Council Chamber on the 1st inst. The nominal loan asked for was £3000—one-third representing the cost of the proposed site; and the remaining two-thirds to enable the Corporation to make an immediate start with the works. The complete outlay will extend to many thousands of pounds; but it is at present impossible to prepare an accurate estimate. Mr. Corrie Grant appeared for the Corporation, and stated that, though the cause of the typhoid outbreak was not yet absolutely determined, the Council had decided to deal most rigidly with the public water supply, and make it perfectly free from suspicion. Evidence was given by Dr. Kelly, Medical Officer of Health (who recommended that the existing works should be closed, and an entirely new supply of water obtained), as well as by Mr. J. Mansergh and Mr. Lucas, the geologist, both of whom affirmed the desirability of the site selected at the foot of the New Downs. Mr. Gainsford, an extensive owner of land in the neighbourhood, objected to the site, on the ground that he has 23 wells in the line of the proposed works, and that his supply is likely to be interrupted thereby. A meeting of the Town Council was held on the same day, at which it was resolved to purchase the works of the West Worthing Water Company, who embrace the west ward of Worthing in their area of supply.

**The Amendment of the Burghs Gas Supply (Scotland) Act, 1876.**—In the JOURNAL for the 18th ult., we mentioned that a short Bill had been introduced to amend the Burghs Gas Supply (Scotland) Act, 1876; and we gave the text of the principal clause. This has been amended, and now stands as follows: "The provisions of the 18th section of the recited Act, which enact that the Commissioners for executing that Act shall not manufacture or store gas or any residual products upon any lands without the previous consent in writing of the owner, lessee, and occupier of every dwelling-house situate within 300 yards of the limits of such lands, shall be modified and altered to the following effect: It shall no longer be necessary to make the return to the Board of Trade required by the recited Act; but, before proceeding with such manufacture or storeage, the Commissioners shall give notice in writing to every owner, lessee, and occupier of every dwelling-house situate within 300 yards of the limits of the land in question, and by advertisement published once a week for two weeks in any newspaper circulating within the burgh, of their intention to proceed with such manufacture and storeage. In the event of any owner, lessee, or occupier refusing or delaying to give the consent provided for in the recited Act for more than ten days after the last date of publication of such advertisement, the Sheriff may, on the application of the Commissioners, and after such investigation and inquiry as he may deem necessary, by a deliverance under his hand find and declare that such consent may be dispensed with. Such deliverance shall be final, and not subject to review; and the Sheriff shall make such finding as to the expenses of the application as shall seem to him just in the circumstances. It shall not be in the power of the Commissioners to renew such application until the expiration of a period of twelve months from the date of the deliverance. In this section the word 'Sheriff' shall not include Sheriff-Substitute."

**The Electric Lighting Scheme for Stafford.**—The principal matter to engage the attention of the Stafford Town Council at their last meeting was a recommendation of the Electric Lighting Committee that the scheme for an electrical installation proposed by the Gas Engineer (Mr. J. F. Bell), and endorsed by Dr. John Hopkinson, be carried out; and that application be made to the Local Government Board for authority to borrow £20,000 for the purpose, £12,000 of which is to be spent at once. Alderman Peach, Chairman of the Committee, moved its adoption. He said that Dr. Hopkinson did not suggest any street electric lighting at present, but only the supply of private consumers. He also thought the proposed site at the gas-works was about as good as could be obtained. Dr. Hopkinson gave it as his opinion that they could supply the electric light at a small profit with from 15,000 to 20,000 lamps. They had already got customers for 15,000 lamps, at the price of 7d. per unit. The system recommended was the continuous current, low-tension one. This was thought to be the best for Stafford, as it lent itself most readily to extension when required. The motion was seconded, and then Alderman Lloyd moved the rejection of the scheme. He argued that, what with the building of a new infectious diseases hospital, and the construction of a deep sewerage system, he thought the town was already too heavily loaded with debt. Besides this, he had never heard a single individual outside the Council express an opinion in favour of the light. Mr. Johnson also spoke against the proposal on much the same grounds. Alderman Bagnall contended that electric lighting could be made to pay. In his own works, he put down an installation some three or four years ago; and he calculated that now they had saved the cost of it. The motion was carried by twelve votes to eight. Sufficient land is to be set apart at the gas-works for a site for the electric supply station, and Mr. Bell is to be requested to prepare plans, &c.

**The Alleged Lead Contamination of the Mossley Water Supply.**—A couple of months ago it was reported that several cases of lead poisoning had occurred in the borough of Mossley, which is in the water supply district of the Ashton-under-Lyne and District Joint Water Committee. As the result, analyses have been made of the water; and at the meeting of the Mossley Corporation last Thursday, Alderman R. S. Buckley made a statement on the subject. From this it appeared that the traces of lead in the water drawn from the services were very faint indeed. The worst case was 1 part in 125,000, and in the majority of cases it was not so much as 1 part in 250,000 parts.

**Electric Lighting for Cheltenham.**—Last Tuesday the Cheltenham Town Council considered a report of the Electric Lighting Committee in which they recommended the introduction of the high-pressure alternating current system of electric lighting for the town. It was stated that the Committee had had the advantage of an interview with Mr. W. H. Preece, who had pronounced himself in favour of the Committee's scheme. It was suggested that the matter should be adjourned in view of the smallness of the attendance of members; but this was not acted upon, and the report was adopted by ten votes to one. The Town Clerk was subsequently instructed to take the necessary steps to obtain the approval of the Board of Trade to the system proposed to be adopted, and to apply to the Local Government Board for sanction to a loan not exceeding £16,000.

**The Salaries of Deputy Water Engineers.**—At the last meeting of the Water Committee of the Cardiff Corporation, a number of returns were submitted showing the salaries paid to water engineers in several towns of similar size and population to Cardiff; these returns having been obtained in view of the application made at the last meeting of the Committee by the Deputy Water Engineer (Mr. Priestley) for an increase of salary. At the present time, Mr. Priestley is in receipt of £300 a year. It was found, however, that very few towns were similarly placed to Cardiff. Only in one or two instances were "assistant" or "deputy" engineers engaged; and the average salary had, therefore, to be deducted from the sums paid to the heads of this department in the various towns referred to, which amounted to £400 per annum. After a little discussion, it was agreed that an increase of £50 should be granted.

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 301.)

| Issue. | Share | When ex-Dividend | Dividend & Bonus | NAME. | Paid per Share | Closing Prices. | Rise or Fall in Wk. | Yield upon investment. |
|---|---|---|---|---|---|---|---|---|
| £ | | | p. c. | GAS COMPANIES. | | | | £ s. d. |
| 590,000 | 10 | 13 Apl. | 10½ | Alliance & Dublin 10 p. c. | 10 | 17½—18½ | +½ | 5 13 6 |
| 100,000 | 10 | " | 7½ | Do. 7 p. c. | 10 | 12—13 | +½ | 5 15 1 |
| 300,000 | 100 | 1 July | 5 | Australian (Sydney) 5 % Deb. | 100 | 102—104 | .. | 4 16 2 |
| 100,000 | 20 | 31 May | 8 | Bahia, Limited | 20 | 10½—11½ | .. | 13 18 3 |
| 200,000 | 5 | 12 May | 6½ | Bombay, Limited | 5 | 5½—6 | .. | 5 8 4 |
| 40,000 | 5 | " | 6½ | Do. New | 4 | 3¾—4¼ | .. | 6 2 6 |
| 380,000 | Stck. | 24 Feb. | 11½ | Brentford Consolidated | 100 | 222—227 | .. | 5 1 4 |
| 180,000 | " | " | 8½ | Do. New | 100 | 168—173 | .. | 4 18 3 |
| 220,000 | 20 | 15 Mar. | 11½ | Brighton & Hove Original | 20 | 41—43 | .. | 5 6 11 |
| 888,500 | Stck. | 31 Aug. | 5 | Bristol | 100 | 104—107 | .. | 4 13 5 |
| 320,000 | 20 | 13 Apl. | 11½ | British | 20 | 42—44½ | .. | 5 4 7 |
| 50,000 | 10 | 15 Mar. | 11½ | Bromley, Ordinary 10 p. c. | 10 | 19—20 | .. | 5 15 0 |
| 51,510 | 10 | " | 8½ | Do. 7 p. c. | 10 | 15—16 | .. | 5 6 3 |
| 328,750 | 10 | 28 July | 2 | Buenos Ayres (New) Limited | 10 | 5½—6½ | .. | 1 1 6 |
| 200,000 | 100 | 1 July | 6 | Do. 6 p. c. Deb. | 100 | 97—100 | .. | 6 0 0 |
| 150,000 | 20 | 13 July | 8 | Cagliari, Limited | 20 | 25—27 | .. | 5 18 6 |
| 550,000 | Stck. | 28 Apl. | 12½ | Commercial, Old Stock | 100 | 243—248 | .. | 5 0 10 |
| 165,000 | " | " | 9½ | Do. New do. | 100 | 185—190 | .. | 5 0 0 |
| 160,762 | " | 15 June | 4½ | Do. 4½ p. c. Deb. do. | 100 | 125—130 | .. | 3 9 3 |
| 800,000 | Stck. | 15 June | 13 | Continental Union, Limited | 100 | 228—233 | .. | 5 11 6 |
| 200,000 | " | " | 10 | Do. 7 p. c. Pref. | 100 | 190—195 | .. | 5 2 7 |
| 75,000 | Stck. | 15 Mar. | 10 | Crystal Palace District | 100 | 190—193 | .. | 5 2 7 |
| 486,090 | 10 | 28 July | 10 | European, Limited | 10 | 21—22½ | .. | 4 10 11 |
| 354,060 | 10 | " | 10 | Do. Partly paid | 10 | 15—16½ | .. | 4 13 9 |
| 5,646,590 | Stck. | 10 Feb. | 12 | Gaslight & Coke, A, Ordinary | 7½ | 228—233 | +1 | 5 3 0 |
| 100,000 | " | " | 4 | Do. B, 4 p. c. max. | 100 | 95—99 | .. | 4 0 10 |
| 665,000 | " | " | 10 | Do. C, D, & E, 10 p.c. Pf. | 100 | 263—268 | .. | 3 14 7 |
| 30,000 | " | " | 5 | Do. F, 5 p. c. Prf. | 100 | 120—125 | .. | 4 0 0 |
| 60,000 | " | " | 7½ | Do. G, 7½ p. c. do. | 100 | 175—180 | .. | 4 3 4 |
| 1,300,000 | " | " | 7 | Do. H, 7 p. c. max. | 100 | 170—175 | .. | 4 0 0 |
| 463,000 | " | " | 10 | Do. J, 10 p. c. Prf. | 100 | 262—267 | .. | 3 14 10 |
| 476,000 | " | " | 6 | Do. K, 6 p. c. Prf. | 100 | 158—163 | +1 | 3 13 7 |
| 1,061,150 | " | 15 June | 4 | Do. 4 p. c. Deb. Stk. | 100 | 125—128 | .. | 3 2 6 |
| 294,850 | " | " | 4½ | Do. 4½ p. c. do. | 100 | 128—132 | .. | 3 8 2 |
| 908,000 | " | " | 6 | Do. 6 p. c. do | 100 | 172—177 | .. | 3 7 9 |
| 3,800,000 | Stck. | 12 May | 12 | Imperial Continental | 100 | 220—225 | .. | 5 6 8 |
| 75,000 | 5 | 15 June | 6 | Malta & Mediterranean, Ltd. | 5 | 5—5½ | .. | 5 9 1 |
| 560,000 | 100 | 4 Apl. | 5 | Met. of Melbourne, 5 p. c. Deb. | 100 | 103—105 | .. | 4 15 3 |
| 541,920 | 20 | 15 June | 5 | Monte Video, Limited | 20 | 13—14 | .. | 7 2 10 |
| 150,000 | 5 | 31 May | 10 | Oriental, Limited | 5 | 7½—8 | .. | 6 5 0 |
| 60,000 | 5 | 29 Mar. | 7 | Ottoman, Limited | 5 | 4¼—4⅝ | .. | 7 3 8 |
| 166,870 | 10 | — | 2 | Pará Limited | 10 | 2—2½ | .. | — |
| | | | | People's Gas of Chicago— | | | | |
| 420,000 | 100 | 2 May | 6 | 1st Mtg. Bds. | 100 | 100—105 | .. | 5 14 3 |
| 500,000 | 100 | 1 June | 6 | and Do. | 100 | 98—102 | .. | 5 17 8 |
| 150,000 | 10 | 28 Apl. | 5 | San Paulo, Limited | 10 | 8½—9¾ | .. | 5 5 4 |
| 500,000 | Stck. | 24 Feb. | 15½ | South Metropolitan, A Stock | 100 | 297—302 | .. | 5 2 8 |
| 1,350,000 | " | " | 12 | Do. B do. | 100 | 244—248 | .. | 4 16 9 |
| 260,000 | " | " | 13 | Do. C do. | 100 | 253—258 | .. | 5 0 9 |
| 750,000 | " | 13 July | 5 | Do. 5 p. c. Deb. Stk. | 100 | 148—152 | +1 | 3 5 9 |
| 60,000 | Stck. | 15 Mar. | 11½ | Tottenham & Edm'nton, "A" | 100 | 213—220 | .. | 5 4 6 |
| | | | | WATER COMPANIES. | | | | |
| 744,897 | Stck. | 29 June | 10 | Chelsea, Ordinary | 100 | 260—265 | +1 | 3 15 5 |
| 1,720,252 | Stck. | 29 Mar. | 8 | East London, Ordinary | 100 | 213—218 | +3 | 3 13 5 |
| 544,440 | " | 29 June | 4½ | Do. 4½ p. c. Deb. Stk. | 100 | 140—145 | .. | 3 2 11 |
| 700,000 | 50 | 15 June | 8½ | Grand Junction | 50 | 110—113 | +1 | 3 15 2 |
| 708,000 | Stck. | 10 Feb. | 11 | Kent | 100 | 280—285 | .. | 3 17 2 |
| 1,043,800 | 100 | 29 June | 9½ | Lambeth, 10 p. c. max. | 100 | 239—244 | .. | 3 17 10 |
| 406,200 | 100 | " | 7½ | Do. 7½ p. c. max. | 100 | 197—202 | .. | 3 14 6 |
| 310,000 | Stck. | 29 Mar. | 4 | Do. 4 p. c. Deb. Stk. | 100 | 129—132 | .. | 3 0 7 |
| 500,000 | 100 | 10 Feb. | 12½ | New River, New Shares | 100 | 329—334 | .. | 3 12 8 |
| 1,020,000 | Stck. | 28 July | 4 | Do. 4 p. c. Deb. Stk | 100 | 132—135* | .. | 2 19 3 |
| 902,300 | Stck. | 15 June | 6 | S'thwk & V'xhall, 10 p. c. max. | 100 | 149—154 | .. | 3 18 0 |
| 126,500 | 100 | " | 6 | Do. D 7½ p. c. do. | 100 | 140—145 | .. | 4 2 9 |
| 1,155,066 | Stck. | 15 June | 10 | West Middlesex | 100 | 258—263 | +2 | 3 16 0 |

*Ex Div

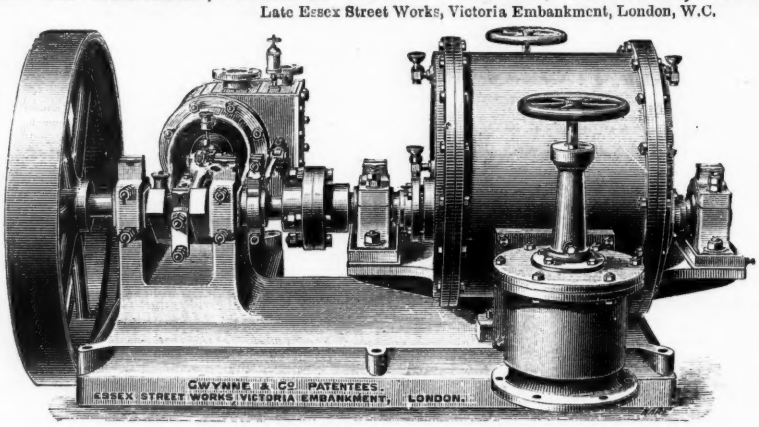
**The Belfast Water Commissioners' Bill.**—A letter announcing that their Bill had passed through both Houses of Parliament was read at a recent meeting of the Belfast City and District Water Commissioners; and the Chairman (Mr. R. J. M'Connell, J.P.) took the opportunity of making a statement concerning the position of the Commissioners under their new powers. He said that the Commissioners were practically forced, by the rapid growth of the population and trade of Belfast, to take measures for a further and improved supply of water. The Bill as drafted was mainly devoted to the Mourne scheme; and though alterations of detail had been made with the view of getting rid of opposition in Parliament, nothing had been inserted in the Bill in any way to weaken or defeat any of the objects which they had in view in its promotion. The present total supply of water, including the yield of the works now under construction, amounted to rather more than 11 million gallons per day; and the demand was a little above 10 million gallons. Therefore, in spite of all their precautions and prevention of waste, the demand and supply would soon be pretty evenly balanced. As laid out, the scheme would give a first instalment of 10 million gallons per day. In other words, they could thus double the existing supply of water; and if at the end of a number of years the city still continued to increase, additional supplies could be brought in from the Mourne district, amounting in all to about 30 million gallons per day. Regarding the Bill, one very important element must not be omitted; and it was this—that while in England and Scotland all water-works authorities had to give compensation of about one-third of the whole supply available, under the Bill the Commissioners had power to take the whole of the water. To fully understand this, it was only necessary for him to refer to the very costly works for storing compensation water that had had to be constructed throughout England and Scotland for the sole accommodation of riparian owners. The works which had been authorized would cost a great deal of money; but, as compared with the experience of other towns, and looking at the results, the whole outlay would be moderate. Further, the Commissioners had obtained the unusually long term of twenty years for the carrying out of the scheme; and if it was found in the early future that, from any cause whatever, the Commissioners should hold their hand, they were perfectly free to do so.


## GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." **GWYNNE & CO.,** TELEPHONE No. 2698.

**HYDRAULIC AND GAS ENGINEERS, BROOKE STREET WORKS, HOLBORN, LONDON, E.C.**

Late Essex Street Works, Victoria Embankment, London, W.C.




Engine and Exhauster Combined on One Bed-Plate.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.

*GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.*

*Catalogues and Testimonials sent on Application.*

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

*NO OTHER MAKER CAN DO THIS.*

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.


**NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.**

**Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.**


OXIDE OF IRON.

**O'NEILL'S Oxide has a larger annual** sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

**ANDREW STEPHENSON, Agent.**
Please address all communications to the Company, as above.

**ANDREW STEPHENSON, Agent for** BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

**VOLCANIC Fire Cement (Winkelmann's)**
Fire Resistance 4500° Fahr.
ANDREW STEPHENSON, Sole Agent, 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

**JOHN ROMANS & SON, EDINBURGH.**
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

GOLD MEDAL, 1892.

**TUBES and Fittings for Gas, Steam, and** Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

**JAMES LAWRIE & CO. supply Best** SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

**W. C. HOLMES & Co., Huddersfield;** AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. II., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

**J. & J. BRADDOCK, Globe Meter Works,** Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

**MR. J. C. CHAPMAN,** Fellow of the Chartered Institute of Patent Agents, advises on all matters connected with LETTERS PATENT FOR INVENTIONS and the PROTECTION OF TRADE MARKS, &c., at home and abroad. Preliminary Information and Handbook on application.
70, Chancery Lane, LONDON, W.C.

**HUTCHINSON BROTHERS,** Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works sundries.
Telegrams: "HUTCHINSON BROS., BARNSLEY."

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

**BALE & CO., direct Importers** from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
190 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

**FINEST Quality of Natural Bog Ore.**
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

**MESSRS. DEBENHAM, TEWSON,** FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

**LIQUOR, Tar, and Spent Oxide wanted.**
BROTHERTON AND CO., Ammonia and Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID.

**JOHN NICHOLSON & SONS, Chemical** Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

**SADLER AND CO., LIMITED,** MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

**PORTER & CO., Gowts Bridge Works,** LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

**JOHN RILEY & SONS, Chemical Manu**facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

CHARTERING, FORWARDING, AND INSURANCE.
**ROBERT BRUCE FITZMAURICE, 29,** Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

**GAS Companies, Corporations, and** Chemical Manufacturers interested in the extraction of Cyanogen Compounds are hereby advised that I am prepared to INTRODUCE PROCESSES ADAPTED TO THE RECOVERY OF CYANOGEN as Crude Prussian Blue or Yellow Prussiate of Potash.
These Processes are now in practical operation in England and the United States, and are covered by Letters Patent.
For particulars, apply to S. DYSON, Chemical Works, Frizinghall, BRADFORD.

**WANTED, by a Young Man, who has** served over five years to the Gas-Fitting, a Situation as GAS-FITTER. Well up both in Lead and Iron Fitting and Meter and Stove Fixing, or would not object to a Situation as Meter Inspector. Can be well recommended.
Address Mr. J. MASON, Gas-Works, OAKHAM.

**WANTED, a Gas-Meter Inspector.** Wages 27s. per week.
Apply, by letter, giving references, to No. 2271, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**EXHAUSTER (Rotary), perfectly New** (Makers, Dempster and Sons), 20,000 cubic feet per hour, ON SALE, cheap.
Apply to T. G. MARSH, 41, Corporation Street, MANCHESTER.

**FOR SALE—A 5000 feet Exhauster, by** Gwynne, with outside Bearings and Couplings; also one without outside Bearings. Both in good condition.
Apply to J. CHAMBERS, Gas-Works, HENLEY-ON-THAMES.

GAS CANNEL.
**FOR SALE—1000 tons of North Wales** SMOOTH CANNEL, immediate delivery. Gas per ton, 11,300 cubic feet. Illuminating Power, 23 candles.
Apply to MONTAGU HIGGINSON AND CO., 6, York Buildings, LIVERPOOL.

CORPORATION OF BIRMINGHAM.
**FOR SALE—Three Massive Brass** GASALIERS, until recently used for lighting the Town Hall, Birmingham.
These Gasaliers are now re-lacquered as new, and are complete, ready for re-fixing.
Apply to the FITTINGS SUPERINTENDENT, Gas Department, Council House, BIRMINGHAM.

**FOR SALE, the following second-hand** GAS PLANT:—
GASHOLDER, 35 ft. by 14 ft.
GASHOLDER and Cast-Iron TANK, 30 ft. by 17 ft.
Four PURIFIERS, 12 ft. square by 4 ft. 6 in. deep.
Cast-Iron SCRUBBER, 26 ft. high by 10 ft. diameter.
CONDENSERS to pass 500,000 cubic feet per diem.
EXHAUSTER to pass 20,000 cubic feet per hour.
Also various other sizes of above or any Gas Plant. Inquiries invited.
Apply to SAML. WHILE, 60, QUEEN VICTORIA ST., E.C.

SPECIAL BARGAIN.
**FOR SALE—Two perfectly new Cast-**Iron SCRUBBERS, 10 feet diameter by 50 feet high, with Wrought-Iron Domes, Cast-Iron Spiral Staircase, &c., complete. All plates machine planed. One or both Scrubbers will be sold to suit purchasers.
A perfectly new 30,000 per hour HORIZONTAL DOUBLE PUMP RECIPROCATING EXHAUSTER, with Steam-Engine, with Connections and Valves.
One Second-hand (thoroughly overhauled) VERTICAL PUMP EXHAUSTER, with Steam-Engine (with clean Water and Liquor Pumps attached), to pass 7000 cubic feet of Gas per hour.
The whole of the above Plant can be inspected, and full particulars with prices will be sent, on application to No. 2241, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF NELSON.
(GAS DEPARTMENT.)

**THE Gas Committee of the above Cor**poration invite TENDERS for the supply of a STATION GOVERNOR.
Further Particulars and Form of Tender may be obtained from the Gas Engineer, Mr. W. Foster.
Tenders to be endorsed "Tender for Governor," and addressed to me the undersigned, and sent in on or before Twelve o'clock noon, on Tuesday, the 22nd of August, 1893.

By order,
R. M. PRESCOTT,
Town Clerk.

Town Hall, Nelson,
Aug. 10, 1893.

**TENDERS wanted for about 2000 tons** of FLINT COLLIERY CANNEL in stock at Colliery. Price to include loading into trucks. Analysis on Application.
Apply to the NEW FLINT COAL AND CANNEL COMPANY, 5, Windsor Buildings, George Street, LIVERPOOL.

CARNARVON CORPORATION GAS-WORKS.

**THE Gas Committee invite Tenders for** the surplus TAR produced at their Works for One Year ending Sept. 30, 1894.
The quantity of Coal carbonized will be about 2000 tons.
Further Particulars may be obtained from the undersigned, to whom endorsed tenders must be addressed on or before Saturday, Aug. 26 inst.

THOMAS WILKINSON,
Manager.

Gas Office, Carnarvon,
Aug. 9, 1893.

CONTRACT FOR TAR AND SULPHATE OF AMMONIA.

**THE Inverness Town Council are pre**pared to receive OFFERS for TAR and SULPHATE produced at their Works up to the 15th of May, 1894.
Particulars may be obtained by applying to the Manager at the Gas-Works.
Tenders, endorsed, and addressed to Kenneth Macdonald, Esq., Clerk to the Council, will be received up to Wednesday, the 30th of August.
Gas-Works, Inverness,
Aug. 9, 1893.

BOROUGH OF WIDNES.

**THE Widnes Corporation invite Tenders** for the purchase of about 700 tons of GAS TAR from their Gas-Works for the Twelve Months ending the 30th of September, 1894.
Forms of Tender and Conditions of Contract may be obtained from Mr. I. Carr, Assoc.M.Inst.C.E., Gas-Works, Widnes.
Endorsed tenders to be delivered to the undersigned not later than the 4th of September prox.
The Corporation do not bind themselves to accept any tender.

H. S. OPPENHEIM,
Town Clerk.

Town Hall, Widnes,
Aug. 12, 1893.

RAMSGATE CORPORATION.
(GAS AND WATER DEPARTMENT.)

**THE Gas and Water Committee invite** TENDERS for the supply of about 110 tons of best BRIMSTONE ACID (what is known as 80 per cent. Acid, with a Specific Gravity of 142° Twaddel), to be delivered in equal monthly quantities between the 1st of September next and the 1st of September, 1894.
Tenders to be sent in, addressed to the Chairman of the Gas and Water Accounts Committee, on or before noon on Monday, Aug. 21, 1893, endorsed, "Tender for Sulphuric Acid."
The Committee do not bind themselves to accept the lowest or any tender.
Full particulars on application to

WILLIAM A. VALON,
Engineer.

STOCKTON-ON-TEES CORPORATION.

TENDERS FOR GAS COAL.

**THE Gas Committee of the above Cor**poration invite TENDERS for the supply in whole or in part of 30,000 tons of GAS COAL for the year ending Aug. 31, 1894.
Particulars and Form of Tender can be obtained on application to the undersigned at the Gas-Works.
Tenders, sealed and endorsed "Tender for Gas Coal," to be sent in not later than noon of the 24th day of August, 1893, addressed to M. B. Dodds, Esq., Town Clerk, Stockton-on-Tees.
The Gas Committee do not bind themselves to accept the lowest or any tender.

WILLIAM FORD,
Manager.

Gas-Works, Stockton-on-Tees,
July 27, 1893.

TO TAR DISTILLERS AND OTHERS.

**THE Directors of the Gloucester Gas**light Company invite TENDERS for the surplus TAR produced at their Works for One, Two, or Three Years, from the 1st day of October next.
The Tar will be delivered into Boats or Barges at the Company's Wharf, on the Gloucester and Berkeley Canal.
Offers to be at per ton of 200 gallons, and per ton by weight.
Payments, cash monthly.
Further Particulars may be obtained on application to Mr. R. Morland, the Company's Engineer.
Sealed tenders, endorsed "Tender for Tar," and addressed to the Chairman, Gas Offices, Eastgate, Gloucester, to be delivered not later than Wednesday, the 30th day of August inst.
The Directors do not bind themselves to accept the highest or any tender.

By order,
WILLIAM E. VINSON,
Secretary.

Gas Offices, Gloucester,
Aug. 10, 1893.

COLNEY HATCH GAS COMPANY.

NOTICE OF GENERAL MEETING.

**NOTICE is hereby given, that the** ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, New Southgate, on Tuesday, the 29th day of August next, at Six o'clock in the evening precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June last, to declare Dividends, and for other purposes.

By order,
W. H. HARDY, F.C.A.,
Secretary.

Aug. 10, 1893.

TO CONTRACTORS.

**THE Dunfermline Gaslight Company,** Limited, invite TENDERS from experienced Contractors for the construction of a BRICK GAS-HOLDER TANK, 102 feet in diameter and 21 feet deep, on the site of the Company's Works at Grange Road, Dunfermline.
The Drawings and Specifications may be seen at the Offices of the Company, and at the Office of Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.
Copies of the Bill of Quantities, and Form of Tender, may be obtained from the latter, on payment of Two Guineas, which will be returned on receipt of a *bonâ fide* tender.
Sealed tenders, endorsed "Gas Tank, Contract No 10," to be addressed to the Chairman, so as to reach me not later than Ten o'clock, on Thursday, the 24th day of August, 1893.
The Company do not bind themselves to accept the lowest or any tender.

HUBERT POOLEY,
Manager and Secretary.

Gas Offices, Dunfermline,
Aug. 10, 1893.

BROMLEY GAS CONSUMERS' COMPANY.

**NOTICE is hereby given, that the** ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the "Bell Hotel," Bromley, Kent, on Thursday, the 24th day of August inst., at Seven o'clock precisely, to receive the Report of the Directors, the Balance-Sheet confirmed by the Auditors, to declare Dividends, and for General Business.
The Transfer Books will be closed from the 12th to the 25th of August, 1893, both days inclusive.
By order of the Board,

HENRY W. AMOS,
Secretary.

Offices at the Works, Bromley,
Kent, Aug. 10, 1893.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

**NOTICE is hereby given, that the** ANNUAL ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at the Offices, Willoughby Lane, Tottenham, on Saturday, the 26th day of August inst., at Half-past Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last, to declare a Dividend, for the Election of Two Directors and an Auditor for the ensuing Year, and for transacting General Business.
The Transfer Books for Consolidated Stocks will be closed from the 12th to the 28th inst.

By order,
JAMES RANDALL,
Secretary.

Offices of the Company:
Willoughby Lane, Tottenham,
Aug. 11, 1893.

MITCHAM AND WIMBLEDON DISTRICT GAS-LIGHT COMPANY.
(INCORPORATED BY ACT OF PARLIAMENT 1867.)

**NOTICE is hereby given, that the** FIFTY-THIRD ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of this Company will be held in the Board-Room, at the Works, Mitcham, in the County of Surrey, on Tuesday, the 29th day of August, 1893, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and a Statement of the Accounts for the Half Year ended the 30th of June last, and to declare a Dividend; also to pass a Resolution, authorizing the conversion of the fully paid-up Shares of the Company into a General Capital Stock, in accordance with the power conferred by Section 61 of the Companies' Clauses Consolidation Act, 1845; and also to pass another Resolution, in accordance with Section 82 of the same Act, putting in force the power conferred by Section 34 of the Mitcham and Wimbledon Gas Act, 1867, for reducing the number of Directors to six, and for General Business.
The Transfer Books will be closed from the 14th inst. until after the Meeting.

By order,
BENJAMIN GREEN,
Secretary and Manager.

Offices and Works: Western Road, Mitcham,
Aug. 8, 1893.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

TO THE PROPRIETORS.

**NOTICE is hereby given, that the** ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, London, on Friday, the 1st of September, 1893, at Two o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1893, to declare Dividends, to elect Auditors, and for other purposes.
And Notice is hereby given that, immediately after the Ordinary General Meeting, a SPECIAL GENERAL MEETING will be held, at which the Directors will submit the following Resolution to the Proprietors:—
"That the Directors are hereby authorized to convert the Original Shares of the Company into Original Consolidated Stock, the 'A' Ordinary Shares into 'A' Ordinary Consolidated Stock, and the 'B' Preference Shares into 'B' Preference Consolidated Stock."
And Notice is hereby given, that at the said Special General Meeting the Directors will apply to the Proprietors to pass such Resolution or Resolutions as to the Meeting may appear expedient for the purpose of authorizing the raising of further Capital in pursuance of the Provisions of the Brighton and Hove Gas Act, 1893.
The Transfer Books of the Company will be closed from the 19th of August to the 1st of September, both days inclusive.

By order,
W. H. HARDY,
Secretary

Offices: 5, Great Winchester Street,
London, E.C., Aug. 14, 1893.

*NOW READY.*
**GAS AND WATER CO.'S DIRECTORY, 1893.**
Seventeenth Annual Issue. 5s.
**GAS-WORKS STATISTICS, 1893.**
Fifteenth Annual Issue, 3s. 6d.
**WATER-WORKS STATISTICS, 1893.**
Thirteenth Annual Issue, 2s. 6d.
**Handsomely Bound in One Vol., Price 10s.**
LONDON: HAZELL, WATSON, & VINEY, Ltd.,
1, CREED LANE, E.C.

**ROBERT MARSHALL,**
**CANNEL COAL MERCHANT,**
**97, WELLINGTON STREET, GLASGOW.**
***Prices and Analysis of all the Scotch Cannels on application.***

**MEIKLEJOHN'S PATENT**
**Improved Slide-Valve Anti-Dip.**
Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.
Is cheap and easily fixed to any form of main.
Will be found the most efficient appliance of the kind yet introduced.
Further particulars and price from
**C. MEIKLEJOHN,**
**GAS-WORKS, RUGBY.**
(Late N. MEIKLEJOHN, Longwood.)

**NEWBATTLE CANNEL.**
**Highest Results in Gas, & Excellent Coke.**
QUOTATIONS ON APPLICATION TO
**THE LOTHIAN COAL COMPANY,**
LIMITED,
NEWBATTLE COLLIERIES,
**DALKEITH, N.B.**

**COKE BREAKERS,**
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT.)
*New Design, with two Cutting Rollers, making less Breeze than their old pattern.*
For Exhauster Advertisement, see last week.
**GEORGE WALLER & CO.,**
PARK STREET, SOUTHWARK, E.C.,
*And at STROUD, GLOUCESTERSHIRE.*

**JAMES OAKES & Co.,**
**ALFRETON IRON-WORKS, DERBYSHIRE,**
AND
**Wenlock Iron Wharf, 21 & 22, Wharf Road,**
**CITY ROAD, LONDON, N.**
Manufacture and keep in Stock at their Works
(also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers and rendering leakage impossible.

For **FIRE-BRICKS,** the most durable for **GAS-FURNACES,**
ADDRESS
**JAMES WHITE & Co., Limited,**
**ALBERT WORKS, WIDNES.**

**HEBBURN MAIN GAS COALS.**
Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.
For prices, f.o.b. Ship or Delivered by Rail, apply to
**THE WALLSEND & HEBBURN COAL COMPANY, LTD.,**
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

**LONDONDERRY GAS COALS**
FROM THE
**MARQUIS OF LONDONDERRY'S COLLIERIES,**
COUNTY OF DURHAM.
Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.
FOR PRICES AND PARTICULARS, APPLY TO
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**CAST-IRON PIPES**
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Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.
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OUGHTIBRIDGE, near SHEFFIELD,
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**SILICA BLOCKS, BRICKS, AND CEMENT**
OF SUPERIOR QUALITY
**FOR GAS-FURNACES.**
Trade Mark: "SILICA."
**These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their**
**GREATER DURABILITY**
**strongly recommended where EXCESSIVE HEATS have to be maintained.**

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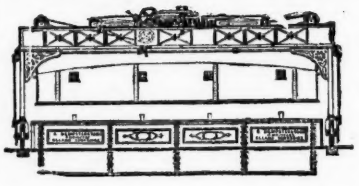
**PURIFIERS** (MACHINED JOINTS)
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**BOLDON GAS COALS.**
**Worked by THE HARTON COAL CO., LTD.,**
**Output about 3000 tons per day.**

| ANALYSIS— | | |
|---|---|---|
| Yield of Gas per ton . . | 10,500 | Cubic Feet. |
| Illuminating Power . . | 16·9 | Candles. |
| Coke . . . . . | 66·7 | Coke. |
| Sulphur . . . . . | 0·86 | Sulphur. |
| Ash . . . . . | 2·04 | Ash. |

**Boldon Gas Coals are supplied under contract to**
The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company and to many other Companies at Home and Abroad.
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**ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.**
**ALDWARKE MAIN GAS COAL**
**Analysis: 12,600 feet of 19-candle gas per ton.**
**Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.**
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## BOGHEAD CANNEL.

| | |
|---|---|
| Yield of Gas per ton | 13,155 cub. ft. |
| Illuminating Power | 38·22 candles. |
| Coke per ton | 1,301·88 lbs. |

## EAST PONTOP GAS COAL.

| | |
|---|---|
| Yield of Gas per ton | 10,500 cub. ft. |
| Illuminating Power | 16·3 candles. |
| Coke | 70 per cent. |

## SOUTH PELAW MAIN GAS COAL.

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|---|---|
| Yield of Gas per ton | 10,500 cub. ft. |
| Illuminating Power | 16·3 candles. |
| Coke | 73·1 per cent. |

*For Prices and complete Analysis, apply to*

**THOS. W. DANCE & SONS,**

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

**E. FOSTER & CO.,**

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## HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

**600,000 Tons per Annum.**

Full particulars on application to

**MR. MARK ARCHER,**

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## THORNLEY GAS COALS

WORKED BY THE

## WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

**THORNLEY AND WHEATLEY HILL COLLIERIES.**

**The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—**

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.

*Tudhoe Gas-Works,*
*Spennymoor,*
*8th June, 1893.*

Messrs. The

**WEARDALE IRON & COAL COMPANY, LTD.**

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusiuely at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.

Yield of Coke: 13¾ cwt.

**Illuminating Power of Gas,** average of a series of tests, **17 Sperm Candles.**

The Coke was of excellent quality.

**The following is a complete ultimate Analysis of the Coal.**

| | Per Cent. |
|---|---|
| Carbon | 83·128 |
| Hydrogen | 5·116 |
| Oxygen | 7·401 |
| Nitrogen | 0·585 |
| Sulphur | 0·620 |
| Ash | 3·130 |
| Water | 0·020 |
| | 100·000 |

**Analysis of the Coke.**

| | |
|---|---|
| Carbon | 93·31 |
| Sulphur | 0·61 |
| Ash | 5·00 |
| Moisture | 1·08 |
| | 100·00 |

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the

**WEARDALE IRON & COAL Co., Ld.**

QUAYSIDE, NEWCASTLE-ON-TYNE.

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# WILLEY & Co.,

## Gas Engineering Works, Commercial Road, Exeter,

MANUFACTURERS OF EVERY DESCRIPTION OF

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**GASHOLDERS, Telescope and Single Lift,** any size. Some of the largest in the Kingdom, erected by this Firm, are giving the highest satisfaction.

**PLANS and SPECIFICATIONS** furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

**PURIFIERS, CONDENSERS, WASHERS, ENGINES** and **EXHAUSTERS, STATION METERS** and **GOVERNORS,** manufactured and erected.

Makers, by permission of that eminent authority **MR. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

**WET AND DRY METERS,**

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

*Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.*

**NIDDRIE CANNEL**

A FIRST-CLASS CANNEL COAL,

Yielding a large volume of rich Gas, and fully 60 per cent. of first-class Coke.

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Gas Companies are solicited to try Samples of the

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RAVENSTHORPE, NEAR DEWSBURY.

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**"CURLEY CANNEL."**

YIELD: 15,306 CUB. FT. PER TON OF 30·62-CANDLE POWER.

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YIELD: 12,321 CUB. FT. PER TON OF 21·321-CANDLE POWER.

PRICES AND PARTICULARS OF

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LEESWOOD COAL AND CANNEL MINES,
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Also of IRON and STEEL CYLINDERS for the conveyance of COMPRESSED GAS.

**PRICES ON APPLICATION.**

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NEARLY

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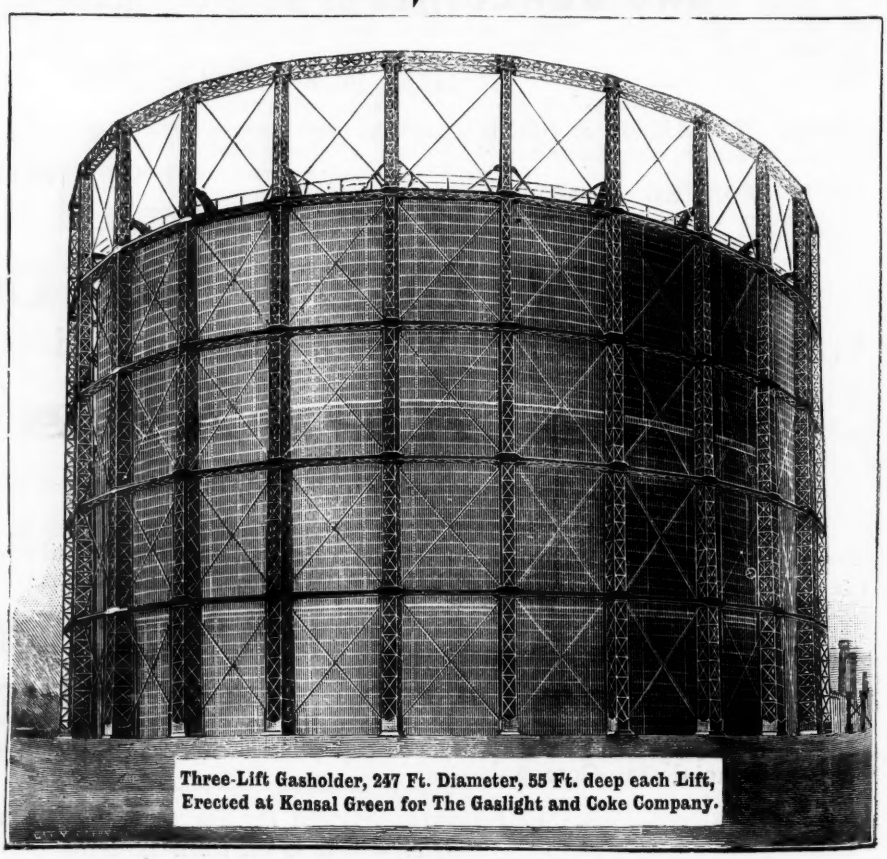
CUBIC FEET

CAPACITY.



Three-Lift Gasholder, 247 Ft. Diameter, 55 Ft. deep each Lift, Erected at Kensal Green for The Gaslight and Coke Company.

*Price One Guinea.*

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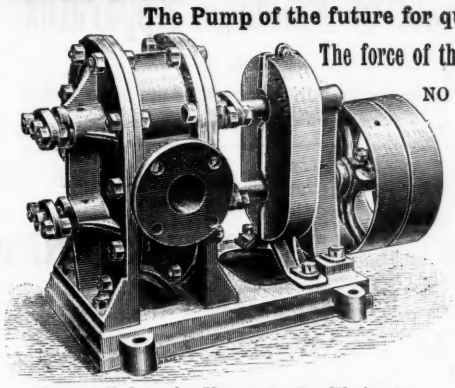
**The Pump of the future for quickly and economically moving large bodies of Water.**

The force of the Piston Pump with the capacity of the Centrifugal combined.

NO SLIDES OR FRICTIONAL WORKING PARTS.



As supplied to the Harrogate Gas-Works for Pumping Gas Liquor.

NO PRIMING.

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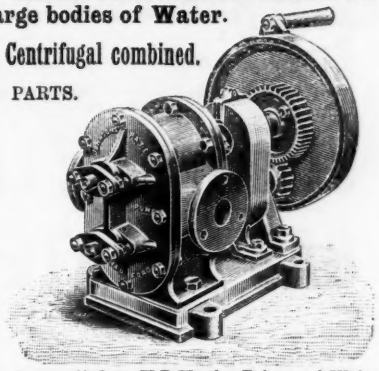

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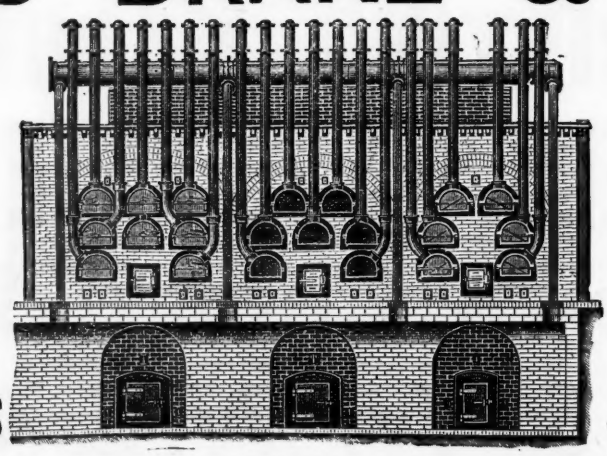

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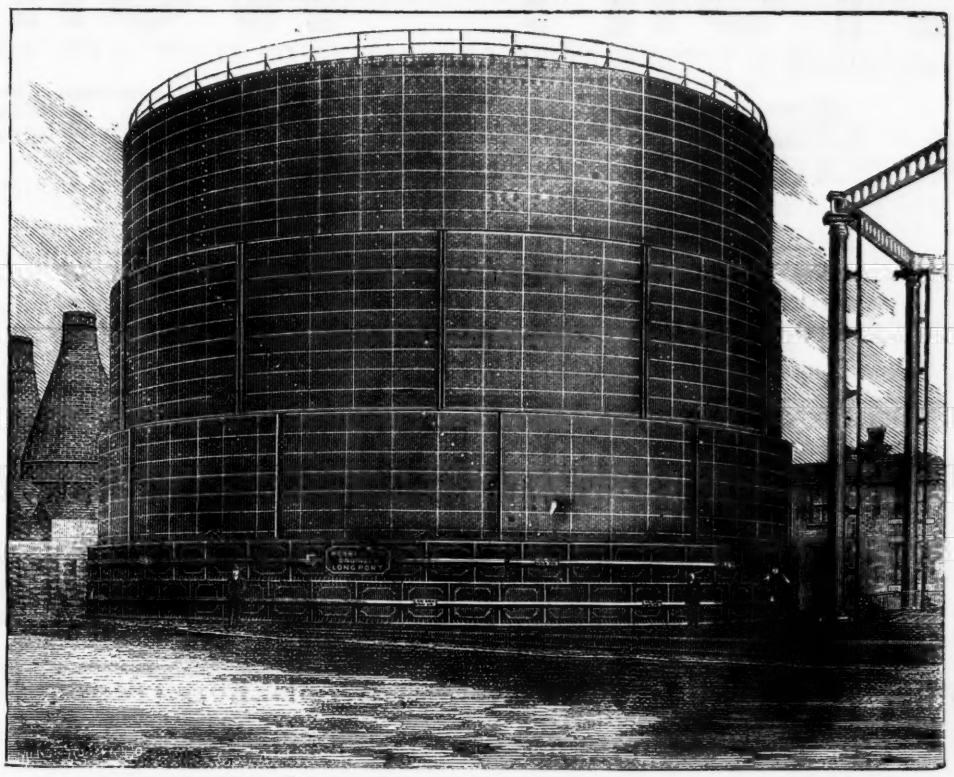
**WHEREBY COSTLY GUIDE-FRAMING IS DISPENSED WITH.**



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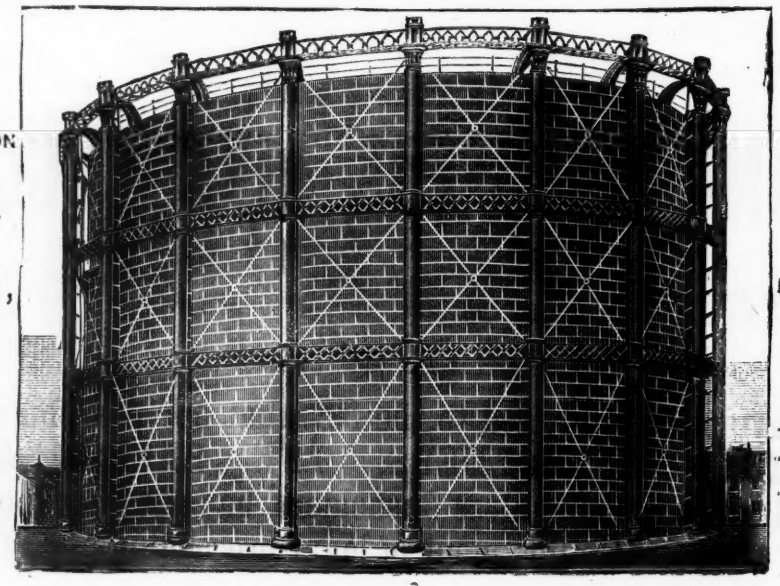

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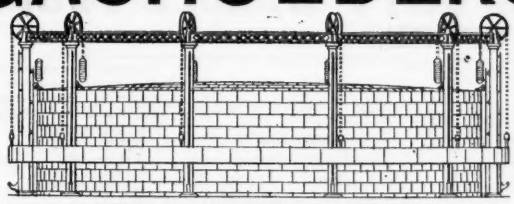

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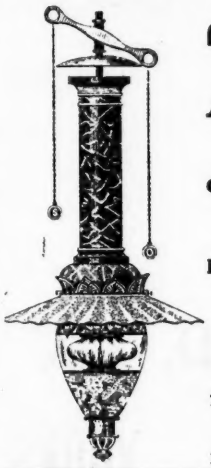

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RETORTS CAREFULLY PACKED FOR EXPORT.

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London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London,—Tuesday, Aug. 15, 1893.